# The Chemical Age

**A Weekly Journal Devoted to Industrial & Engineering Chemistry**

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*NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.*

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### 1920-21

THIS issue is largely occupied with reviews of developments in chemical science and industry during 1920. In addition to a detailed survey of the principal events and movements of the year by a well-known industrial chemist, Dr. E. B. Maxted, one of our first authorities on atmospheric nitrogen fixation, discusses the remarkable progress this country has made in this field during the year. Mr. W. J. U. Woolcock, M.P., contributes an interesting sketch of the passage of the Dyestuffs Bill through Parliament, though the story would be more interesting still if this accomplished Parliamentarian were free to reveal the whole diplomacy that lies behind that remarkable achievement. The principal features of trade in chemicals during the past rather uncertain year are described by "W. G.W.," one of the best known and popular figures in the chemical business; and an acknowledged authority on British Patents deals with the leading inventions of 1920. These reviews, contributed by first-rate authorities on the subjects dealt with, indicate what an important if also anxious year 1920 has been for all engaged in chemical industry. Though the causes for anxiety have not yet disappeared, there are hopes, at least, that they are abating, and to all our readers we offer the sincerest wish that the New Year on which we enter to-day may be one of continued prosperity and progress.

### The Next Bill

THE Dyestuffs Bill, forced through Parliament by a piece of brilliant organization, is not the end of the matter. Dyestuffs constitute only one branch of our key industries, and a measure of more general application, but based on the same principle of special protection for specially essential national industries, must follow. It is, indeed, possible that the first measure of next session may be one devoted to the safeguarding of our key industries. The organization which achieved such a triumph over the Dyestuffs Bill will no doubt be available for the more general measure.

It is one of the objections to the protection of specific industries that preference granted to one is inevitably demanded by more. This, however, ought not to prejudice the consideration of cases on their merits. The question to be determined in each case is whether the conditions which justify the protection of the dyestuffs industry apply equally to others. If they do, they have an equal claim on the support of Parliament. The first of these industries to claim attention now is the glass industry. Already the case is beginning to be stated in the way the dyestuffs case was, and it looks just as good. It is rather surprising to learn from a well-informed writer that when war broke out in 1914 there was but one firm—Chance Brothers of Smethwick—manufacturing optical glass in the British Empire, amd that before four years and four months of war had drawn to a close this firm were manufacturing at Smethwick in one year optical glass sufficient to meet three years of the whole world's peace demands. All of this, it is stated, was figured, cut, ground, and polished by British workmen and fitted into instruments of British make surpassed by none. There is nothing the Germans can do, at Jena or elsewhere, in the way of glass-making and the manufacture of scientific instruments that we in this country cannot do just as well. With so favourable a position one might ask—what, then, is there to fear? The danger is the old German method of dumping competitive products here at lower figures, until the newly recovered British trade has been strangled, and their prices can safely be put up again. The process is even now going on. The Government has recognized the optical glass and instrument industry as a key industry, and early in

the new session a vigorous attempt may be expected to make good the pledge that it should receive special treatment.

Reverting to the Dyestuffs Bill, attention may be directed to the interesting sketch of its progress through Parliament contributed by Mr. W. J. U. Woolcock, M.P., whose Foch-like handling of the forces in support of the measure largely, we suspect, accounts for so remarkable a legislative achievement. Mr. Woolcock, however, seems less concerned about the joys of success than about the results which the passage of the Bill was intended to secure. The Government, he says, in a sentence which sums up the whole position, has given the dyemakers their Bill; can the dyemakers give the country the dyestuffs? The answer is that they must, and no subsidiary or sectional interests must be allowed to stand in the way. They have made substantial progress, judged by tonnage of output, but it may be that the more difficult work lies ahead in the production of the rarer and finer dyestuffs for which we have still to depend on foreign sources. That these can be produced in this country as well as in any other, there can be no serious doubt. But their production involves effort, expenditure, research, and loyalty to the pledge under which the Bill puts the industry. Success may not be won for some time. The dyemakers are secure for a period of ten years. If in that time they have not made good, the failure will be a national humiliation.

## Cement Industry Profits

A REPORT has just been issued by a Sectional Committee which was appointed to investigate the financial state of affairs in the cement trade. The conclusions arrived at by the Committee are instructive in that they point to the existence of a "combine" in the cement industry, which constitutes an amalgamation of a number of undertakings formerly operating independently. It is well known, of course, that the cement industry in this country has not generally been prosperous, but the introduction of up-to-date organisation and plant, coupled with the prevailing abnormal demand have improved the financial position without, moreover, increasing the price of cement in this country to an unreasonable extent. Matters have, of course, been considerably assisted by the high rates which have lately been ruling for the exported material; and there can be no question that, but for this outside assistance, the home consumer would have been faced with very much higher prices. Detailed costing investigations of two manufacturing concerns selected at random show that, while the cost of production varies considerably at different establishments it has risen to approximately 2½ to 3 times the pre-war figure, whereas over the same period the selling price has on an average increased by 2 to 2½ times. The increased production costs are mainly accounted for by additional charges for labour, fuel and transport rates, and also by a decreased output. As an instance of the serious nature of the last-named it may be noted that the total production of the two concerns whose accounts were examined in detail fell off in the last financial year by 44 per cent., as compared with the pre-war period, while neither of these concerns has had to pay Excess Profits Duty. The Committee make various recommendations for overcoming the present difficulties in connection with production and distribution. They suggest, for instance, that home demands should receive priority and that the prevailing shortage of fuel should be countered by a reduction of the fuel now exported.

To those not actually associated with the manufacture of cement one of the most interesting portions of the report will be that which deals with the historical side of the industry. The term Portland Cement was, it is believed, first used by J. Aspdin, of Leeds, in a patent, No. 5,022, which he secured in 1842; but as the material he produced was not properly clinkered, it could not compare with modern cement, and since Aspdin's invention numerous improvements have been made, until by the middle of the last century it was beginning to be regarded by engineers as a really reliable material of construction. The important work of such engineers as Stevenson and Brunel greatly aided the development of the application of cement. During more recent years the improvements made in the industry have been largely by way of plant and methods of manufacture, and in the direction of producing a more consistently uniform product to comply with the terms of definite specifications. Previous to the year 1900 there appears to have existed little if any organisation in the cement industry in this country. Although some few public companies were in being, the manufacture was generally in the hands of private firms. The formation in 1900 of the Associated Portland Cement Manufacturers, Ltd., constituted the first successful attempt at combination, and the organisation was, in effect, an amalgamation by purchase of a number of independent works, which were all producing cement to comply with various specifications. The next stage of organisation was the promotion in 1912, of the British Portland Cement Manufacturers Ltd. A number of independent firms then trading outside the Associated Company were absorbed in the new British Company, and the operation resulted in 75 per cent. of the total productive capacity of this country passing into the control of these two companies, which together are now known in the trade as "The Combine."

A further development of the organisation of the industry—but in another direction—occurred in 1918, when the Cement Makers' Federation was formed, primarily for the purpose of fixing minimum prices in various areas and settling trading conditions, by amalgamating certain local "alliances" then existing.

## The New Regulations

WE publish on another page some extracts from the new draft regulations issued by the Home Office under the Factory and Workshop Act, 1901, for application to manufactures and processes in chemical works. These give some idea of the new rules, but the document is so important that manufacturers would be well advised to study the complete provisions. Copies may be obtained from the Factory Department of the Home Office, S.W.1, and as any objections must be lodged within 30 days from December 24, less than a month remains for any action which it may be considered

desirable to take to amend the terms. These new regulations are intended to supersede the Special Rules first established in 1894. The Special Rules for chemical works are one of the very few codes of Special Rules now remaining, and it is desired, in accordance with recent procedure, to convert them into General Regulations applying to the whole trade. It is also necessary that the requirements of the Special Rules should be brought up to date. Owing to changes in methods of manufacture the Rules are considered to be no longer adequate for the protection of workers in certain sections of the industry, and they fall far short in many respects of the precautions now taken in the best type of works. Before the war enquiries were instituted with a view to a revision of the Rules. These were necessarily suspended during the war, but have since been completed and the results are embodied in the code of Regulations now proposed.

The new Regulations will also supersede the Regulations made on December 30, 1908, for the manufacture of nitro and amido derivatives of benzene, and those made on August 9, 1913, for the manufacture of chromate and bichromate of potassium or sodium, both of which codes will be revoked as from the date when the new Regulations come into force. The Regulations have been drafted so as to exclude the manufacture of white compounds of lead (including carbonate, sulphate, nitrate and acetate of lead) and the manufacture of red or orange lead or of flaked litharge, both of which manufactures are the subject of separate codes. They also expressly exempt the processes of bleaching, dyeing, mercerising, brewing, tanning and the distillation of alcohol, and all processes carried on only by way of experiment. It has been recognised that in certain classes of chemical works special dangers exist which are not found in other branches of the industry, and for this reason the Regulations are divided into two parts, the first of which is applicable to all chenical works as defined in the Schedule, and the second to those only in which special dangers need to be dealt with. Care has also been taken to avoid overlapping with the Regulations under the Alkali, &c., Works Regulation Act, 1906.

In accordance with the provisions of the Factory Act it is necessary for the Regulations to be formally published in draft before being made, and, if objections of substance are taken to them either by the occupiers or by the workpeople, or by any other persons affected, and the Secretary of State cannot see his way to amend the draft Regulations, these objections will, under the Statute, be the subject of full inquiry by a competent person appointed by the Secretary of State, and the report of the person holding the inquiry will be considered by the Secretary of State before the final Regulations are made. At the inquiry employers, owners, occupiers and workpeople, and all others concerned will be entitled to a full hearing. If, therefore, any person desires the Regulations to be further considered, he should lodge objection in accordance with Section 80 of the Factory and Workshop Act, 1901. Every such objection must be in writing, and must state (*a*) the draft Regulations or portions of draft Regulations objected to, (*b*) the specific grounds of objection, and (*c*) the omissions, additions and modifications asked for.

## U.S. Grants for Research

We have more than once recently drawn attention to the valuable scientific results published by the United States Bureau of Standards and other departments devoted to research. The grants asked for by the Bureau of Standards for the next financial year are interesting, as indicating the importance attached to this class of work :—

For metallurgical research, including alloy steels; properties of aluminium alloys; development of metal substitutes; investigation of new metallurgical processes, $70,000. An increase of $45,000 over the current appropriation.

For apparatus, machinery, appliances, laboratory supplies, furniture for laboratories and cases for apparatus, $90,000. Increase, $15,000.

For testing varnish materials, soap materials, inks and chemicals, $50,000. Increase, $20,000.

To develop colour standards and methods of manufacture and of colour measurement, with special reference to their industrial use in standardisation and specification of colourants such as dyestuffs, inks and pigments, $12,000. Increase, $2,000.

To study methods of measurement and technical processes used in the manufacture of pottery, tile and other clay products, $35,000. Increase, $10,000.

For the investigation of the problems involved in the production of optical glass, $40,000. Increase, $15,000.

To investigate textiles, paper, leather and rubber in order to develop standards of quality and methods of measurement, $40,000. Increase, $25,000.

For the standardisation and design of sugar-testing apparatus, $40,000. Increase, $10,000.

High-temperature measurement investigation, $15,000. Increase, $5,000.

To determine experimentally important physical constants of materials, $25,000. New appropriation.

For purchase, preparation and distribution of standard materials to be used in checking chemical analyses and in the testing of physical measuring apparatus, $15,000. A new appropriation.

For investigation of the problems involved in the electrodeposition of metals, $15,000. A new appropriation.

For the equipment, maintenance and operation of a low-temperature laboratory and the production of liquefied gases, $15,000. A new appropriation.

For an investigation of radio-active substances and the methods of their measurements and testing, $15,000.

## The Calendar

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| Jan. 3 | Society of Chemical Industry : "The Smith Continuous System of Carbonisation," by G.H. Thurston ; "The Recovery of Solvent Vapours from Air" ; "The Analysis of Liquid and Gaseous Mixtures of Ether, Alcohol, and Water," by Irvine Masson and T. Lawson McEwan. 8 p.m. | Burlington House, Piccadilly, London |
| 4 | Royal Photographic Society of Great Britain : "On the Results of the Demonstration of Portraiture by Artificial Light October 5, 1920," by N. E. Luboshez. 7 p.m. | 35, Russell Square, London. |
| 6 | Chemical Association : "Leather and Tanning," by Miss C. Delany. 4.30 p.m. | Royal College of Science, Dublin. |
| 6 | Society of Chemical Industry (Bristol Section). 7.30 p.m. | Bristol. |
| 7 | Society of Chemical Industry (Manchester Section) : "An Industrial Research Association," by A. W. Crossley. 7 p.m. | Textile Institute, 16, St. Mary's Parsonage, Manchester. |

# 1920: A Retrospect

## Developments in Research, Industry, and Invention

THOSE who anticipated that a substantial reduction in the cost of industrial productions and in the cost of living would occur in 1920 must have been disappointed during the first half of the year, but in the second half depression accompanied by substantial fall in the prices of raw materials and of manufactured articles did occur in many industries. When the Armistice was signed a general shortage of goods existed, and anybody who had anything to sell other than war material could sell readily at a high figure. Industrial undertakings started working at high speed in order to satisfy the markets, and high wages and large dividends were the general rule, although some exceptions could be mentioned. The shortage no longer exists and the continued high cost of living, together with the high cost of labour and the very heavy taxation make it difficult for British manufacturers to compete with foreign producers. Great numbers of operatives attached to the various industries are now either out of employment or are working short time. Matters will no doubt right themselves in time, but the period of abnormal industrial prosperity has ended and the difficult problem of maintaining normal prosperity under existing conditions has now to be solved by Capital and Labour. Cordial co-operation and an intelligent study of the situation by all concerned will go far towards preventing the closing down of many undertakings.

One of the most remarkable features of the year was the high rate of interest offered for new capital in industrial concerns of high repute, eight per cent. cumulative preference shares were frequently issued, and, in some cases, even ten per cent. preference shares were offered. The Bank rate was maintained at the high figure of seven per cent. for the greater part of the year. Export business with certain countries continued to be difficult owing to the abnormal rate of money exchange. In other cases the rate of exchange favoured importers to the detriment of British manufacturers. Shipping accommodation became plentiful and freight charges fell.

Coal was as usual a source of trouble, although towards the end of the year supplies became more plentiful. Prices remained extremely high for home consumers, but such coal as the Controller allowed to be exported fetched yet higher prices. In December the demand for coal from abroad fell sharply, and it was reported that the countries of Western Europe had become well stocked owing largely to the importation of coal from America. The national strike of coal miners in the United Kingdom which lasted from October 16 until November 3 caused heavy financial loss both to the miners and to the community in general.

Rubber-producing companies suffered from a disastrous fall in the selling price of raw rubber during the latter months of the year. With rubber fetching in London only about one shilling per pound, some producers must have been selling at less than cost price. Most of the producers have agreed to restrict their output during the ensuing year in order to give the overfed markets a chance of recovery.

In many places where gold-mining is carried on the working costs were so heavy that the mines were prevented from becoming unprofitable only by the substantial premium on the metal. For a considerable portion of the year gold was selling at over 40 per cent. above its nominal value of 85s. per ounce.

### Research and Education

An encouraging feature of the year was the overcrowding of the Universities and other Institutions devoted to higher grade education. The study of both pure and applied chemistry in this country is more extensive, and probably more intensive, than at any previous period and should result in material progress in chemical knowledge. Industrial undertakings also show indications of realising their duties in the way of promoting and encouraging research. In 1919 men interested in the petroleum industry gave £210,000 to Cambridge University for their School of Chemistry, and in 1920 they gave £122,850 towards the £500,000 required by the University of Birmingham. In 1920 also the shareholders of Brunner, Mond & Co. agreed to allow the directors to distribute £100,000 for the furtherance of scientific education, and although one of the shareholders objected on the ground that the resolution was *ultra vires* Mr. Justice Eve refused to grant an injunction to restrain the directors from distributing the money.

In the gas industry a fund is being raised to increase the endowment of the Livesey Chair at Leeds University.

British Dyestuffs Corporation, Ltd., gave £5,000 to Oxford University to meet the cost of extending the organic chemical laboratory, and Mr. Whitley of Trinity College gave £10,000 to the same University for endowment of a Chair of biochemistry.

The United Alkali Co., Ltd., gave £10,000 to Liverpool University for new chemical laboratories, and Pilkington & Sons, Ltd.., gave £5,000 for the same purpose. Alfred Holt & Co., gave £15,000 to the same University for a Chair of Metallurgy.

### The Chemical Societies

Little progress was made during the year towards the formation of an association having authority to act for the whole community of British chemists in the matters of registration, qualifications and professional regulations; but each individual society continued to do good work in its own peculiar way. Efforts are being made by the Federal Council for Pure and Applied Chemistry, under the leadership of Lord Moulton, to raise a substantial sum for the provision of a commodious meeting house for the use of all descriptions of chemists, and more will probably be heard about this matter in the near future.

The Chemical Industry Club continues to flourish, and now has over 700 members. Its second annual dinner was held in November, and was a very successful function. The British Association of Chemists increased its number to over eleven hundred members, and has organised ten sections for work in different parts of Great Britain. Like the National Association of Industrial Chemists, the B.A.C. is now registered as a Trade Union.

A decision of importance to Chartered Societies was delivered by Mr. Justice Peterson as the result of a friendly action against the Pharmaceutical Society by Mr. Jenkin, a member of the Council of that Society. He complained, among other things, that the Society had taken part in the promotion of an Industrial Committee, which was concerned with the relationship between employers and employed. The Justice held that it is *ultra vires* for the Society to act as a Trade Union or to regulate the wages or conditions of work in the drug industry, and that the Society is not entitled to spend money in maintaining an Industrial Committee formed to deal with such matters.

Apparently, therefore, the various Chartered Chemical Societies should not concern themselves with certain matters of importance which may be lawfully dealt with by the two Trade Union chemical associations. To what extent, if any, it is desirable for the Chartered Societies, two of which do not concern themselves at present with wages, salaries or qualifications, to seek further powers is a debatable point. The increase in the cost of paper and of printing caused anxiety to most scientific societies, and both the Chemical Society and the Society of Chemical Industry raised the annual subscription of members at the close of the year. These two Societies have arranged to co-operate more closely in the future in the matter of publications.

### Colloidal Fuels

Some further progress has been made in the use of so-called colloidal mixtures of oil with finely-divided carbonaceous fuels. The world's supply of fuel oil will probably be too small to satisfy the demand, and if pulverised coal can be added to the oil without materially disturbing the properties of the oil as a clean and fluid fuel the discovery will be of great value to the community. Two papers by American authors dealing with colloidal fuels were read before the Institution of Petroleum Technologists in November. They were interesting expositions of the work which has been done in America with colloidal fuels, and of the general behaviour of such mixtures;

but it is too early yet to speak with confidence of the practical value of the mixtures. Some points in the paper by Mr. Lindon W. Bates which are worth noting are that the flash-point of most of the colloidal fuels hitherto used lies between 250°F. and 280°F., the effect of adding coal to the oil being to raise the flash-point of the mixture above that of the oil. Also that the best grades of colloidal fuel possess greater calorific value per gallon than the oil alone, the specific gravity of the mixture being higher than that of the oil. Sixty-five per cent. of oil a little lighter than water, mixed with 35 per cent. coal, gave a colloidal mixture heavier than water and possessing a calorific value of 182,800 B.Th. U. per gallon, as compared with the 177,600 B.Th.U. per gallon of the oil alone. Some of the speakers in the discussion on the papers did not, apparently, share the enthusiasm of the authors of the papers for colloidal fuels, but the subject has aroused great interest and is of importance..

### Dyes and Prohibition

The year was unsatisfactory for British dye manufacturers. The low value of the German mark as compared with the British sovereign, and the lapse of the restrictions to the importation of synthetic dyes, enabled users of dyes to purchase dyes more cheaply and in greater variety than was possible when selection was more or less restricted to British dyes. When the British Dyestuffs Corporation, Ltd., was formed in July, 1919, the importation of foreign dyes was restricted, and was permitted only by a special licence, and it was understood that restriction would continue for ten years. In December, 1919, after hearing a case dealing with the Customs seizure of some pyrogallic acid, Mr. Justice Sankey decided that prohibition of importation by Proclamation or Order in Council is illegal and invalid, except in the case of arms, ammunition or things of a like character. To prohibit the importation of dyes or of pyrogallic acid it was apparently, necessary to pass a special Bill through Parliament, and the Dyestuffs (Import Regulation) Bill was accordingly introduced early in December, and is now an Act. The Bill provides for prohibition of import, except under licence, for a period of ten years from the passing of the Bill. Import for re-shipment to customers abroad will still be permitted. The licences will be granted by a Committee consisting of five representatives of dye users, three representatives of dye manufacturers, and three others not directly interested in the use or manufacture of dyes. As a consequence of the unrestricted importation of dyes which occurred after publication of the Sankey judgment the British Dyestuffs Corporation had to dismiss hundreds of its employees, and shareholders who had invested in what they believed to be a protected industry had just cause of complaint. The textile industries, naturally, do not wish to be restricted to British dyes or British prices, but the Government is fully alive to the importance of maintaining a dye industry which manufactures intermediate products required for the preparation of most of the explosives used in modern warfare. The knowledge that protection against foreign competition is to be applied for ten years only may serve to prevent the industry from acquiring those faults which are liable to arise in any industry when the spur of competition is removed.

### The Gas Industry

The chief event associated with gas manufacture and supply was the passing of the Gas Regulation Bill. The Act permits gas undertakings, after obtaining the sanction of the Board of Trade, to sell gas by "therms" instead of by cubic feet. A therm is equivalent to 100,000 British Thermal Units. Each undertaking working under this Act will declare the calorific value of the gas it intends to supply. The number of cubic feet registered by each consumer's meter will be multiplied by the declared calorific value. The resulting figure will be divided by 100,000 to obtain the number of therms sold to each consumer. The new method of multiplying cubic feet by calorific value will facilitate fair comparison between the costs of gas in localities served by different gas undertakings. The calorific value of a thousand cubic feet varies with the quality of the gas, but the calorific value of a therm remains the same whatever the quality of the gas.

To ensure that the calorific value of the gas shall be kept up to the declared value gas examiners will supervise the working of continuous recording calorimeters, if a reliable instrument can be found. Otherwise the examiners will make a series of daily tests with the ordinary water-flow calorimeters at present in use.

The standard price per therm is to be the equivalent of the old standard price per thousand cubic feet, with the necessary addition for the increased cost of manufacture and supply since June, 1914.

Gas undertakings generally were busy during the year in carrying out long-delayed repairs and extensions, but the difficulty in obtaining steelwork and machinery often made progress very slow. The very high costs of coal and of labour made it impossible, in most cases, to reduce the price of gas, and in many localities the price had to be raised. When the Gas Regulation Bill was under consideration an attempt was made to compel gas undertakings to remove all the benzol vapour from the gas before distribution, so that it might be used for motor spirit. The attempt failed. During the war large gas supply undertakings willingly stripped the gas of its benzol and toluene to meet the Government demand for the spirit, but the presence of these vapours, which are readily condensed, tends to prevent rusting of the distribution pipes and blockage of the pipes with naphthalene, and many of the undertakings ceased to use the stripping processes soon after the signing of the Armistice.

### Nitrogen Compounds

During the year a British syndicate was formed by Brunner, Mond & Co. to utilise atmospheric nitrogen for the manufacture of nitrogen compounds on a large scale. The syndicate is called "Synthetic Ammonia and Nitrates, Ltd.," and it has purchased from the Government a site at Billingham-on-Tees, in Durham, which had previously been selected for Government operations of a similar character. Ammonia and ammonium chloride and sulphate will probably be the chief products manufactured by the syndicate. Explosive Trades, Ltd., which has decided to change its name to Nobel Industries, Ltd., will purchase ammonia from the syndicate and convert it into nitric acid and nitrates. It is hoped that an immense business in nitrogen fertilisers will be developed, and thus maintain an essential part of the plant required for the production of high explosives ready for national use in case of emergency.

### Petroleum

The search for petroleum in Great Britain continued throughout the year, but did not meet with great success. Of the seven bores in Derbyshire one has been completed, two have been temporarily shut down to await results obtained from the others, and four are still in progress. Each of the four in progress has reached a depth of over 3,000 ft. The Hardstoft well continues to yield steadily about 50 barrels of crude oil per week, and the total production up to November 27th was 557 tons. In Scotland a little oil was found by the boring at West Calder. Oilfields of England, Ltd., started to bore in September at Kelham, in Notts., and the results of this boring will be watched with great interest. The bore had reached a depth of nearly a thousand feet early in December. A rotary drill worked by American drillers is being used. Although it is anticipated that oil will be found at a depth of 2,500 ft. the equipment is capable of drilling to 5,000 ft.

English Oilfields, Ltd., continued to work on the shale field in Norfolk. The average yield of crude oil recovered per ton of dry shale is stated to be forty-one gallons, from which seven gallons of motor spirit are obtained. Ichthyol is expected to prove a very valuable by-product from the shale oil.

Within the Empire, Trinidad continued to yield large quantities of oil and important discoveries of oil were reported from the neighbourhood of Mackenzie River, in Canada. In Persia the oil wells continued to yield very satisfactorily, and progress was made with the erection of the great refinery at Swansea for the Anglo-Persian Oil Co., although there has been delay owing to labour troubles.

The Anglo-Persian Oil Co. has undertaken the technical and commercial management of Tankers, Ltd., and of the Scottish-American Oil & Transport Co.

The adoption of oil as a substitute for coal in steamships has continued to extend, and if the practice becomes general with all classes of ships there is a probability that in a few years the demand for fuel oil will exceed the supply. The eager search for oil now in progress in all the Continents will probably result in a plentiful supply being available for several

years, but the life of an oil well is usually very short in comparison with that of a coal mine.

During the summer months an interesting petroleum exhibition was open at the Crystal Palace, as an adjunct to the Great War Exhibition. Most of the British companies associated with the petroleum industry were well represented.

### Power Alcohol

A permanent organisation acting under the Fuel Research Board has been formed for the consideration of matters connected with the use of alcohol for power purposes, and Sir Frederic Nathan has been appointed Power Alcohol Investigation Officer. During the year an interesting Memorandum on Fuel for Motor Transport was issued by the Fuel Research Board. The memorandum states that in 1919 the world production of crude petroleum was 17½ thousand million gallons. The United States produced 74 per cent. of this, but consumed more. A substitute for petroleum spirit must be found. Mixtures of alcohol and benzol have been used with success by the London General Omnibus Co. In this country alcohol is chiefly made from grain and from molasses, but in most parts of the Empire molasses is the most suitable material for alcohol production. It is estimated that the Empire production of molasses would yield 17 or 18 million gallons of alcohol. The petrol imported into the United Kingdom during 1920 is estimated as 250 million gallons, so additional sources of alcohol are required, and research has been started into the possibility of utilising tropical vegetation. In October Professor Dixon delivered a lecture on "Researches on Alcohol as a Motor Fuel" at a conference in London convened by the Imperial Motor Transport Council, in which he discussed the values of alcohol and mixtures of alcohol with benzene and with ether respectively.

### Amalgamations

Several amalgamations of interest to industrial chemists were effected during the year. Lever Brothers as usual, extended their operations, and obtained control of Niger Co., Ltd., the African and Eastern Trade Corporation, and John Knight, Ltd. British Glass Industries bought a controlling interest in United Glass Bottle Manufacturers and a number of smaller glass businesses. Brunner, Mond & Co. purchased most of the shares of the Castner-Kellner Co. and of the Electro-Bleach & By-Products Co.

### Obituary

Amongst those who passed away during the year the following were widely known in the chemical world: Sir William Abney, Professor W. H. Ellis, Mr. C. E. Groves, Mr. A. E. Fletcher, Professor A. K. Huntingdon, Sir J. Norman Lockyer, Mr. J. S. MacArthur, Sir John M. McCallum, Dr. Rudolph Messel, Mr. Spencer Pickering, Professor J. Emerson Reynolds, Professor L. T. O'Shea, Mr. Watson Smith, Mr. F. C. Tipler and Mr. L. P. Wilson. A deplorable accident at the Imperial College of Science and Technology resulted in the death of Mr. W. A. Haward, who had obtained a Salters' Research Fellowship in the College. While engaged in an investigation of gaseous combustion under high initial pressures a Bourdon gauge was shattered, and the dial struck Mr. Haward in the neck. Mr. Haward was only twenty-six years of age, but had already achieved distinction as a scientific worker.

## Chemical and Dyestuff Traders

### What the Association has Done for the Merchant Interest

ACCOMPANYING a circular to members issued this week by the Chemical and Dyestuff Traders' Association is the following memorandum by the chairman (Mr. F. T. T. Reynolds) on the work of the Association since its formation early in the year:—

"The Chemical and Dyestuff Traders' Association has now been in existence over six months, and has already given abundant proof of the need for the existence of such an association, and of the practical value to the collective interests of traders resulting from its continuous activities. The offices at 22, Buckingham Gate are well situated and very commodious. It is intended that the main room overlooking St. James's Park shall be furnished with books, periodicals and papers for reference, with a view to the room becoming eventually a bureau of information for members, and that the offices shall also serve as a meeting place for members and be available, especially for provincial members when in town, for correspondence, telephoning, &c. The secretaries will at all times be pleased to render every possible service to members.

"We have established regular and intimate touch with the various Government Departments concerned with trade and commerce, including the Board of Trade, the Department of Overseas Trade and the Ministry of Shipping. Valuable results have already accrued, and there are abundant indications that chemical and dyestuff traders have not effectively organised a moment too soon, as the Governmental and political factors are for better or for worse certain to figure as a dominant factor in trade generally and in our trade particularly. It is evident that the operations of the Dyestuffs Bill and other extraneous actions will compel unceasing vigilance and the exercise of every possible activity and care if the interests of the traders are to be effectually safeguarded. Without organisation there would be grave danger of irreparable injury to the merchant interest and to our overseas trading.

"By means of deputations, personal interviews and influence, public meetings of traders, and a very widespread and general press propaganda, the Chemical and Dyestuff Traders' Association has voiced and pressed the case for the traders in relation to the Dyestuffs Bill. In the rather fierce controversy that has been evoked two aspects have been fully revealed. First, that the Government are giving full and continued support to the British manufacturers of dyestuffs, and that so far their effective help has been of somewhat limited application, with a tendency to concentration in one direction; second, that the dye users are at a disadvantage as compared with the manufacturers in so far as the users are extremely numerous, with differing view points, whilst the makers are few and on fairly common ground in being the recipients of State assistance and protection.

"Unfortunately, the Board of Trade did not act upon the resolution passed by our Executive Council on November 4, and sent to the President of the Board of Trade, suggesting that a conference of the interests involved should be summoned by the Board of Trade with a view to arriving at a fully considered agreement. In the absence of this, a Bill has been hastily passed through Parliament, practically without amendment, despite the serious opposition of vitally interested parties. It is now the law of the land, and every assistance must be given to make it as much helpful and as little hurtful as possible.

"The Chemical and Dyestuff Traders' Association pressed (*a*) for effective safeguards regarding re-exportations; (*b*) for representation of the traders' interests upon the Advisory Committee; (*c*) for provisions ensuring that State assisted dyestuff makers should not discriminate against the merchants either for home or export; (*d*) for assurances that no monopoly would be established with regard to dyestuffs imported under licence either regarding importation or distribution; (*e*) that opportunity for revision should be given at the end of three years if the scheme proved unsatisfactory in actual operation.

"(*a*) *Re-exports.*—Clause III. of the Bill expressly provides for free importation of goods for re-exportation.

"(*b*) *Representation.*—Assurances were given that the traders, if organised unitedly, would have representation on Advisory Committees. It is hoped that when the constitution of the Advisory Committee is announced it will be found that the traders' interest is represented.

"(*c*) and (*d*).—There is reason to believe that steps are being taken that will result in traders' interests not being squeezed out, but properly respected and acknowledged.

"(*e*).—The Government insisted upon the duration being for ten years.

"We would urge upon all members of the Chemical and Dyestuff Traders' Association to do all they can to get other qualified traders to join our association, if only from the point of view that so doing is a form of insurance. Our negotiations with the British Chemical Trade Association have not so far been successfully consummated. Agreement has been reached upon main principles, and we are now awaiting decision from their Executive regarding our proposals concerning matters of detail."

# The Passing of the Dyestuffs Bill

By W. J. U. Woolcock, C.B.E., M.P.,
General Manager of the Association of British Chemical Manufacturers

The Royal Assent was given to the Dyestuffs (Import Regulation) Bill at midnight on December 23, 1920, and the Act comes into force early in the New Year.

The passing of this Bill is something more than a mere putting on the Statute Book of a piece of Parliamentary legislation. It is the first measure of what to my mind is the beginning of political research. It represents the attempt of Parliament to break away from all the old schools of thought, and to meet present day industrial conditions. The Bill has been supported by some Free Traders, and opposed by others; condemned by some Tariff Reformers, and blessed by others; but it satisfies that large volume of opinion which is voiced by what is commonly called "the Man in the Street."

It was recognised by the Government so recently as the early days of December that unless prompt measures were taken nothing could prevent the decease of the infant British Dyestuffs industry. At that time the Parliamentary session had only three weeks to run, and although there was little doubt that Parliament would be prepared to pass the Bill, there was the gravest reason for doubt whether it could be passed in the few remaining days of an already overcrowded session. The fight was therefore against time rather than against the opponents of the measure. It was introduced and given a first reading on December 2nd. The second reading debate took place on December 7th, and here the Bill was nearly lost. The time allocated was the whole of the evening from four o'clock onwards, but Mr. Devlin secured the adjournment of the House to discuss the arrest of the editor of the *Freeman's Journal*. This was fixed for 8.15 p.m., and supporters of the Bill feared the worst, as it was too much to hope that the second reading would be obtained by that time. This proved to be true, and 8.15 arrived and the debate was interrupted. The Irish motion was, however, closured at 9.45 p.m., and the debate on the Dyestuffs Bill was resumed. At eleven o'clock the closure again had to be applied, and the second reading was carried by a majority of over 200. The second reading debate was decidedly good. Sir Robert Horne was in charge of the Bill, and Sir William Pearce spoke first for its supporters. There was always a supporter ready to follow an opponent in the debate, and when the vote was taken there were still half a dozen members prepared to speak in its favour.

The Bill went upstairs to Committee on the 9th. It was at the Committee stage that the tactics of the opposition showed their full appreciation of the fact that time was of the essence of the measure. The Bill was a short one of forty-five lines, but the amendments proposed were more numerous than the number of lines in the Bill. At the first day's sitting the Committee got as far as the first line of the first clause of the Bill, and its opponents must have been very pleased with their success in occupying so much time on one line only. The following Monday saw a little more progress. On the third day still more progress was made, but only by the imposition of a self-denying ordinance on the part of those who supported the Bill. It was quite easy to reply to the arguments which were being put voluminously by its opponents, but to do so was to assist them to delay the passing of the measure. On the fourth and last day's sitting a serious attempt was made in the morning to debate the constitution and work of the Licensing Committee, but the debate fell away in the afternoon, and by agreement the Bill was got through the Committee at eight o'clock on December 15th.

The Bill, with very slight amendments, came back to the House for the Report stage on December 17th. It being Friday, the House met at noon. All the old amendments which had been defeated in Committee again appeared on the Order Paper. Some of our opponents were heard to make arrangements for breakfast at 5.30 a.m. the next morning (Saturday), but the Report Stage was over by 8.15 p.m., and the Third Reading was obtained an hour later. This enabled the Bill to get a first reading in the House of Lords the same night.

The Second Reading came on December 21st, when the noble Lords who opposed the Bill were in force. The speeches against the Bill outnumbered those in its favour, but the one outstanding speech, apart from those of the Government spokesmen, was one in its favour by Lord Moulton.

Ultimately the Bill was given a Second Reading by 83 to 36. It got through its Committee stage the next day, and secured a Third Reading on December 23rd without amendment.

The opponents of the Bill in the Lords put up a very much better fight than those in the Commons, although they both seemed to have been provided with the same material. Instead of putting down scores of amendments they concentrated on three or four, and the debate was good. Two of the amendments might have been accepted without damaging the Bill very much. But if a single amendment had been made in the Bill it would have had to go back to the Commons, and Parliament was being prorogued that day! Hence the fight was still against time, and the giving by the Government of a Parliamentary pledge overcame the persistent demand for one amendment at least. At midnight the Bill received the Royal Assent. It is now an Act which comes into force on January 15, 1921. The necessary preliminary step without which it was impossible to establish a synthetic organic chemical industry in this country has been taken. Parliament has given the dyemakers the Bill. Can they give the country the dyes? I believe they can, but I am not blind to the difficulties which face them; nor am I at all uncertain that a very different attitude of mind must prevail among those responsible for producing the dyes from what has hitherto been the case. There will have to be real co-operation and not talk of it. There will have to be a pooling of information, and the man best fitted to do one particular job will have to do it.

The constitution of the Licensing Committee is already fixed, but events depend more on the Development Committee. When we hear who compose that committee we shall be in a better position to answer the question: "Will the dyemakers give the country the dyes?"

## British Chemical Plant Association

CHEMICAL plant manufacturers have now an association of their own. The Association of British Chemical Manufacturers having taken the initiative with a view to developing the manufacture of chemical plant in this country, the British Chemical Plant Manufacturers' Association has been formed. The objects are defined thus:—

To promote closer co-operation between manufacturers of chemical plant and the interchange of information among its members and to co-operate with the A.B.C.M. in order that British chemicals shall be made with British plant. To form a medium for placing before the Government the views of British chemical plant manufacturers on matters affecting their industry. To affiliate or co-operate with any other body striving for industrial efficiency or the advancement of applied chemistry or metallurgy, or the industrial or commercial interests of the King's Dominions in connection with chemical plant manufacture.

Mr. J. H. Rawson, of Widnes Iron Foundry Co., has been appointed chairman, and Mr. L. M. G. Fraser, of W. J. Fraser & Co., vice-chairman. The secretary is Mr. W. J. U. Woolcock and the treasurer Mr. E. A. Alliott, of Manlove, Alliott & Co. In addition, the following are included in the executive:—Mr. R. B. Blizzard (T. & C. Clark & Co.), Mr. T. Broadbent (T. Broadbent & Sons), Dr. H. T. Bush (Huntington, Heberlein & Co.), Mr. J. Robinson (Mather & Platt), Dr. R. Seligman (Aluminium Plant & Vessel Co.), Mr. E. C. Watkins (W. Neill & Sons), Mr. W. W. Wright (Cannon Iron Foundries).

The Association has already a membership consisting of twenty-two firms.

# The Nitrogen Industry in 1920

By E. B. Maxted, Ph.D., B.Sc.

It is probable that the feature of the greatest interest in connection with the development of the above branch of chemical industry in 1920 is to be found in the very important steps which have at last been taken towards the practical realisation of the much-discussed nitrogen fixation ideal by way of the synthesis of ammonia. In the first place, Synthetic Ammonia and Nitrates, Ltd., with a capital of £5,000,000, has been formed by Messrs. Brunner, Mond & Co. with the object of developing the large scale synthesis of ammonia on the site of partially-erected Government works at Billingham. The company will have the benefit of practically the whole of the research work on the synthesis which has been carried out in this country during and since the war, and there would appear to be little doubt of its speedy development into a factory of the highest national importance. In the second place, the proposed erection[2] of large scale plant, employing the exceedingly high pressures which are a feature of the Claude system, contains the possibility of important industrial developments. The desirability of employing as high a working pressure as is compatible with the engineering side of the synthesis has long been recognised, and a successful commercial utilisation of so-called "hyper-pressures" under works conditions should constitute an outstanding landmark in chemical technology.

In the following review of work during 1920, the various publications have been grouped under three headings, corresponding to those adopted in the previous review for 1919.[3]

## Nitric Acid and Nitrates

The gradual return to peace conditions has necessarily resulted in the publication of less work on this subject than has been the case in previous years. The absorption of oxides of nitrogen from gas mixtures containing a small proportion of these bodies is dealt with in a patent[4] granted to the Norsk Hydro-Elektrisk Kvaelstofaktieselskab. The absorbent employed consists of an alkali or alkaline earth hydrate and one or more of the oxides of iron, zinc or aluminium. This absorbent is subsequently heated and the oxides of nitrogen obtained in concentrated form. The recovery of nitrogen oxides by a process involving refrigeration has been protected by Guye.[5] In a subsequent specification, refrigeration in conjunction with a solvent is employed.[6] A contribution to the kinetics of the absorption of oxides of nitrogen by dilute nitric acid has been published by E. K. Rideal.[7] With dilute solutions, the process is mainly one of physical solution and follows the monomolecular law. At higher concentrations, the reaction becomes principally a process of chemical combination. Passing to the manufacture of nitric acid by the oxidation of ammonia, much valuable experience of the practical working of the process at H.M. Factory, Craigleith, has been rendered available by Prof. J. Walker in a lecture before the Chemical Society.[8] Platinum gauze catalysts were employed, and the reaction gases, after subsequent secondary oxidation, were absorbed in towers of the usual type. A further section of the lecture is devoted to the recovery of nitric acid by denitration of waste acid from the manufacture of T.N.T. As a supplement to Prof. Walker's lecture, a paper by M. Kaltenbach,[9] in which interesting details are given of the working of a Continental plant for producing concentrated nitric acid from oxides of nitrogen resulting from the synthesis of ammonia, may also be mentioned. In view of the deleterious effect of phosphine on the oxidation of ammonia, a process for the removal of this impurity, devised by C. L. Parsons and L. C. Jones,[10] is of interest, particularly in connection with ammonia derived from cyanamide. The method employed consists in passing, at a temperature of 50-60° C., a mixture of the impure ammonia with air over a catalyst consisting of a metal of the silver group on a carbonaceous support. The phosphine is oxidised to ammonium phosphate, which is retained on the carbon.

In connection with the general technology of the process, the following papers may be noted. G. A. Perley[1] has discussed the influence of the size of mesh of the platinum gauze used as the seat of oxidation. In general, this author considers that smaller meshed nets than those ordinarily employed should be preferred. It is also of interest to note that the Farbenfabrik vorm. Fr. Bayer & Co. state that the addition of moderate proportions of water vapour to the ammonia undergoing oxidation increases the yield and allows the plant to be operated with a greater output,[2] but the water added acts, of course, as a diluent for the nitric acid produced. A survey of the yields of nitric acid obtainable with platinum and with various base-metal catalysts has been given by Neumann and Rose.[3] The survey is interesting, and for details the reader is referred to the original. Finally, what appears to be an admirable method of carrying out the reaction is contained in a proposal by the Badische Anilin- & Soda Fabrik[4] to cool the gases resulting from the oxidation quickly to 400 deg., by using these to heat a steam generator, the gases being then led into a heat exchanger for the purpose of raising the temperature of the fresh mixture entering the oxidation chamber.

The Chile nitrate industry has, as was to be expected, been affected fundamentally by the decreased requirements for nitric acid. For a detailed review of trade conditions, reference may be made to THE CHEMICAL AGE, Vol. III., pp. 8, 181, 258 and 286. In general, the shortage of fuel, together with labour troubles and consequent difficulties in transport, would appear to have contributed towards the inactive state of the nitrate market. An exceedingly lucid, critical discussion of the methods employed in Chile for the extraction of the nitrate has been contributed by A. Bertrand.[5] Many problems of a chemical and engineering nature still await adequate solution, particularly in connection with the economy of fuel during the extraction process and the separate crystallisation of the secondary constituents of caliche. A fresh estimate of the still available quantity of the deposits is given, it being stated that the supply, based on pre-war requirements, will still suffice for about a century. Many of the deposits, however, consist of caliche of relatively low nitrate content.

## Ammonia and Ammonia Salts

The production of neutral sulphate of ammonia has become a matter of considerable technical interest, and in this connection several recently published patents granted to the South Metropolitan Gas Co. may be mentioned. In addition to the special conditions for washing acidic ammonium sulphate with dilute ammonia, contained in Brit. Patent 141,819, the use of ammonium sulphite as a neutralising agent[6] has been recommended. Caking of ammonium sulphate may be prevented by drying at an elevated temperature after neutralisation. One cause of caking is stated by Attwater and Schulze[7] to be due to the presence of pyridine sulphate. A general paper on the large-scale preparation of neutral ammonium sulphate has been contributed by F. Shewring,[8] full details of the plant employed and of the method of treatment being given.

The production of ammonium sulphate by the interaction of ammonia, carbon dioxide and calcium sulphate has also received further attention. Interesting details of the manufacture of ammonium sulphate by this method have been contributed by D. H. B. Wride.[9] Difficulties were encountered

[1] CHEM. AGE, 1920. 2. 636.
[2] CHEM. AGE, 1920. 2. 459, 466; 3. 56.
[3] CHEM. AGE, 1920. 2. 6.
[4] Brit. Pat. 137,071. CHEM. AGE, 1920. 2. 261.
[5] Guye, U.S. Pat. 1,331,104.
[6] U.S. Pat. 1,331,105.
[7] *J. Ind. and Eng. Chem.*, 1920. 12. 531.
[8] *J. Chem. Soc.*, 1920. 117. 382.
[9] *Chim. et Ind.*, 1920. 4. 576.
[10] Brit. Pat. 136,342.

[1] *Chem. & Met. Eng.*, 1920, 22. 125; CHEM. AGE, 1920, 2. 409.
[2] Ger. Pat. 299,643.
[3] *Z. f. angew. Chem.*, 1920, 33. 41 & 51.
[4] Brit. Pat. 145,059; CHEM. AGE, 1920, 3. 243.
[5] CHEM. AGE, 1920, 2. 402, 578.
[6] Brit. Pat. 141,799; CHEM. AGE, 1920, 2. 591.
[7] *Chem. & Met. Eng.*, 1920, 22. 373.
[8] *Gas W.*, 1920, 72. 453. [9] CHEM. Age, 1920. 2. 32.

in the filtration of the calcium-carbonate mud, but these were satisfactorily eliminated by the use of suction filters of the so-called "leaf" type. The yield of ammonia recovered as sulphate was over 90 per cent. It is stated, in a patent taken out by the Badische Anilin & Soda Fabrik,[1] that the filtration may also be facilitated by calcining the gypsum employed.

In the corresponding review of the nitrogen industry for 1919, several processes for the production of ammonium sulphate from nitre cake were mentioned. A further method of operation, involving procedure for the separate precipitation of ammonium sulphate and sodium sulphate, has now been described,[2] for particulars of which the specification itself should be consulted. From a business standpoint, it is interesting to note the formation of the British Sulphate of Ammonia Federation,[3] which has as its object the protection of the interests of producers of ammonium sulphate and represents a very large percentage of firms involved in this production.

### Nitrogen Fixation

In addition to the important commercial developments mentioned in the opening paragraph of the present review, a number of publications dealing with this branch of the nitrogen industry have appeared. Early in the year the final report of the British Nitrogen Products Committee was published,[4] and, following this, a similar official report of developments in the United States.[5] The salient features of these important documents have already been given at length in the CHEMICAL AGE, and attention is directed to the references given in the footnotes.

Passing to the individual processes for the fixation of nitrogen, F. Gros has contributed a study of the known effect of oxygenating air before subjecting it to treatment in an arc for the synthesis of nitric oxide,[6] the air being previously dried and the oxides of nitrogen being removed by cooling to a low temperature. It is stated that the heat recoverable from the reaction products is sufficient to provide the energy for cooling and for the manufacture of the oxygen required.

For the fixation of nitrogen as cyanide, G. Calvert[7] has protected a plant in which the charge is subjected to the action of mechanical agitators in such a way as continuously to expose fresh surfaces of the reaction mixture to the action of nitrogen. In an apparatus for the same purpose, devised by H. B. Kipper,[8] mixing is effected by means of a rotating reaction furnace; while in British patent No. 150,127 adhesion of the briquettes to the walls of vertical retorts is prevented by providing an abrupt enlargement at the point at which the sodium cyanide solidifies.

The equilibrium $Na_2CO_3+4C+N_2 \rightleftarrows 2NaCN+3CO$, which forms the basis of the Bucher process of nitrogen fixation, has been studied by G. B. Fergusson and P. D. V. Manning,[9] with the object of ascertaining the influence of the carbon-monoxide content of the nitrogenous gas, employed for the technical reaction, on the yield of cyanide obtained. The use of producer gas containing even 15 per cent. of carbon monoxide, in place of pure nitrogen, was shown to reduce the yield of cyanide by 30 per cent., and thus the Bucher process would appear to form yet another opening for the utilisation of cheap comparatively pure nitrogen.

The Claude system for the synthesis of ammonia has already been mentioned above, and a full report of the proposals and experimental plant have been given in THE CHEMICAL AGE, Vol. II., p. 466, and Vol. III., p. 56. Further papers by Claude on the subject have also been published in the *Comptes rendus*,[10] and proposals for the construction of pressure furnaces for carrying out the synthesis itself have also appeared.[11]

According to a patent[12] granted to F. J. Metzger, the activity of a catalyst for the synthesis of ammonia is stated to be prolonged by periodically changing the temperature to which it is subjected. Recently published specifications for catalysts for use in synthesis include claims for alkali or alkaline earth cyanamides,[1] preferably mixed with a nitrogen carrier such as iron.

Interesting details of materials for the construction of pressure resisting furnaces for the synthesis of ammonia are contained in two patents[2] taken out by the Badische Anilin & Soda Fabrik. Steel containing chromium, vanadium or tungsten is stated to remain resistant to pressure, even after removal of its carbon by the action of hydrogen. Much nickel should, however, be avoided, unless a relatively high proportion of the other alloying metals is present. A nickel-chromium steel furnace for the synthesis of ammonia has also been described by Davis and Bryan.[3]

The heating element consisted of alundum tubes, wound with nichrome wire. For further details of the construction the original should be consulted.

For the purification of nitrogen/hydrogen mixture, the Soc. Anon. L'Air Liquide[4] claim the use of extremely high pressures for the treatment of gases with palladium/asbestos for the removal of oxygen and for the subsequent removal of the water formed in the purification process. Finally, E. K. Rideal and A. G. Tarrant[5] have described an apparatus for recording the percentage of ammonia in the circulating gases, based on conductivity measurements, while a similar method has been protected by Rideal and Taylor[6] for the estimation of carbon monoxide in the gases employed for the synthesis.

It is, of course, not possible within the limits of a short review such as the present to refer to every paper that has appeared during the course of the year, and for this reason the present article is intended more as a general survey than as a complete record.

## Invention in 1920

**By a Patent Expert**

THE year 1920 has witnessed the gradual return of the industries of the country to normal conditions after the dislocation and upheaval of the five preceding years, and this has been reflected in the matter of patents. The diversion of industries from their normal course during the war necessarily involved the suspension of a great deal of the research work which would otherwise have taken place, and the number of applications for patents in those years materially diminished. The year 1919 gave evidence in an increased number of applications that the work which had been laid aside was being resumed, and this has been still more evident in 1920, which has exceeded all previous records in the number of patent applications. This large increase is partly accounted for by the filing of a large number of international specifications from Germany and Austria under the terms of the Peace Treaty which fixed a time limit for such applications, and abstracts of those specifications of interest to chemists have already appeared in THE CHEMICAL AGE, though most of them have not yet been accepted.

The specifications published during the year do not reveal any very outstanding features of novelty, and inventors appear to have applied themselves more to the detailed improvement of existing processes and apparatus rather than to the invention of new processes, but it frequently happens that an apparently small improvement will multiply the value of an existing process many times over.

The synthesis of ammonia and its oxidation to nitric acid still claim a considerable amount of attention, though here the improvement is rather in detail with the object of obtaining a better yield of ammonia at a lower cost. Patents taken out with this object include the use of a single reaction tube with condensers at intervals, modifications of the catalyst to promote greater activity or to diminish the pressure required, the

[1] Ger. Pat. 303,870.
[2] Brit. Pat. 146,546.
[3] CHEM. AGE, 1920, 2, 609.
[4] CHEM. AGE, 1920, 2, 55, 61, 83, 89.
[5] CHEM. AGE, 1920, 2, 400.
[6] *Comptes rend.*, 1920, 170, 811.
[7] Brit. pat., 140,484. CHEM. AGE, 1920, 2, 477.
[8] U.S. patent 1,322,026.
[9] *J. Ind.* and *Eng. Chem.*, 1919, 11, 946.
[10] *Comptes rend.*, 1919. 169, 1039; 1920, 170, 174.
[11] Brit. patents 142,150, 140,083 and 140,089. CHEM. AGE, 1920, 2, 562, 613.
[12] U.S. patent 1,313,314.

[1] Brit. patent 140,439.
[2] Ger. patents 298,199 and 306,333, additions to 291,582.
[3] *J. Ind. Eng. Chem.*, 1920, 12, 287.
[4] Brit. patents 129,637 and 130,086.
[5] Brit. patent 143,341.
[6] Brit. patent 134,243.

use of chrome vanadium steel for the containing vessel, &c. An attempt to avoid the very high pressures incidental to the Claude process has been made by employing as catalysts certain rare metals which are capable of forming nitrides, and it is claimed that the reaction can then be carried out at atmospheric pressure. One of the principal uses for ammonia is in the manufacture of fertilisers, and processes of considerable interest have been proposed for producing ammonium nitrate by the direct combination of oxides of nitrogen, oxygen, water, and ammonia under special conditions. An interesting example of a complete process for the production of ammonia by synthesis is that in which a mixture of nitrogen, hydrogen, and carbon monoxide is obtained from a producer, the carbon monoxide is replaced by its equivalent of hydrogen by reaction with steam in contact with iron oxide, the mixture is then compressed to 1,400 lb. per square inch, and gases other than nitrogen and hydrogen removed, and the nitrogen and hydrogen then combined to form ammonia.

Considerable attention has also been directed to the improvement of the quality of various chemical products, notably sulphate of ammonia. Patents have been taken out for neutralising free acid in the crystallised salt, and drying with hot air to produce a non-caking salt, and also for removing the various coloured impurities which are usually associated with sulphate of ammonia. Such details may appear of small importance in themselves, but they have a considerable importance in the sale of the product. Similar efforts have also been made to remove coloured impurities from phenols and other coal distillation products.

There has been a notable increase in the number of international convention patents from Norway during the past year, chiefly as might be expected in those processes which involve the use of electrical energy. These relate mainly to the fixation of nitrogen in the form of cyanides and cyanamides, and to the production of aluminium, aluminium nitride, and other aluminium compounds. The chemical industry of Norway appears to be rapidly growing, and is certainly very much alive.

The influence of the shortage of fats has been shown in the attempts emanating from Germany and Austria to obtain fatty acids from substances such as paraffin wax or petroleum. The results claimed are certainly promising, and are evidently being carefully followed up. Alcohol too has been produced from the constituents of water gas by a cyclic process in which methyl formate is obtained from carbon monoxide and methyl alcohol, and is then converted into a larger amount of alcohol, leaving an excess of alcohol to be used again in the cycle.

The principle of catalysis which now underlies so many commercial processes continues to be much studied, and a great deal has been done to improve the catalysts and render them immune from "poisons." A substance known as fibrox consisting of silicon oxycarbide has been proposed as a carrier owing to the very large surface which it presents, and it is claimed to be applicable to the synthesis of ammonia, to the contact process for producing sulphuric acid, and many other processes. The production of organic substances such as acetone and acetic acid from acetylene has been the subject of a number of patents from America and the Continent, but comparatively little appears to have been done in this direction in England. The great bulk of the patents relating to the hydrogenation of oils and the production of such substances as stearine have also come from America and from France. With regard to dyestuffs and finer chemicals, few inventions have been patented from British sources, the great majority having come from Germany. It must be remembered, however, that a good proportion of the latter were international patents, which would normally have been spread over the last five years but for the war, and the dyestuffs industry is still only in its infancy compared with that of Germany. A review of the field of invention in the chemical industry of this country during the year just closed certainly leaves one with the conviction that chemists are not resting content with their achievements in the face of great obstacles during the war, but are devoting their energies with persistence to the still greater arts of peace.

# Chemical Trade in 1920

THE year 1920 has proved a very difficult year for the Chemical Trade and there have been wide fluctuations in values.

At the commencement of the year business was extremely brisk and prices in every direction advanced steadily; delivery dates became more and more distant and the difficulty was to find the material to fulfil the orders that were offered.

This state of affairs continued steadily until about the middle or the end of April when signs began to be apparent that the top of the market in many cases had been reached. Business continued fairly active, however, until about the end of June, with little variation in values. Since that date, however, the market as a whole has declined steadily, while the volume of business transacted has fallen away to a very large extent.

There have been, of course, a number of reasons to account for this state of affairs; many buyers undoubtedly either over-estimated their requirements or purchased in excess of their normal orders during the early months, and the result has been that a considerable number of consumers have not been in the market with fresh business during the last few months.

The bad trade existing in the Textile Industry has also been a considerable factor, while the increasing German and American competition for export trade has resulted in quite a considerable quantity of business being lost to the Home Industry.

The Fine Chemical Trade in this country has been especially badly hit by the German competition which with their depreciated exchange makes it possible for them to sell at well under the cost of manufacture in this country. There are hopes, however, that the interests of the Fine Chemical Industry in which a considerable amount of capital has been sunk will be safeguarded to some extent in the provisions of the Anti-Dumping Bill which the Government proposes to bring in early in the new session.

The export trade, while very satisfactory in the early months of the year, has fallen away to a very large extent, and it is now practically impossible to do business with countries that have a badly depreciated exchange. We therefore open the new year with rather a gloomy outlook as to the immediate future, but taking all circumstances into consideration, we are of opinion that bottom values have now been reached for the majority of products, and that an early improvement in demand is not at all unlikely.

Stocks in consumers' hands are extremely small, while if any system of credits can be devised to assist the continental markets a very good volume of business could easily be transacted for a large number of products produced in England.

ACETONE was a steady market until about April, when the Government stocks having been disposed of, the market sharply advanced and a brisk business was transacted during the period between May and September; since that date the demand has fallen off and the present value may be taken at £95 per ton.

ACIDS have been a peculiar market and have been subject to violent fluctuations.

ACETIC opened the year at about £70 per ton for 80 per cent. and continued in good request at steadily-increasing values until May, when the price was about £90 per ton, after that date, however, the market has steadily declined, and we close the year at the price of £55 per ton for 80 per cent. Technical. During the early part of the year the majority of supplies came from America, and latterly Continental offerings have been very much in evidence.

CITRIC was an advancing market from about 4s. 2d. per lb. in January to 6s. 6d. per lb. in April, after which date it commenced to decline and is now almost unsaleable at 2s. 9d. per lb.

FORMIC has been a fairly steady market until just recently when the German competition is beginning to be felt, and the actual market at the close of the year may be taken at about £110 per ton, although Continental producers are quoting considerably cheaper for forward.

LACTIC has been a poor market throughout the year and relatively has been in very little request, mainly owing to the stagnation in the Leather Industry.

OXALIC has been a fairly active market. Business started in January at about 2s. per lb. and continued to advance until the end of May, when the product stood at 2s. 10d. per lb.; since that date it has fallen steadily away until to-day it can be obtained at in the region of 1s. 2d. per lb. Latterly Continental competition has been very marked, and this, with the very poor demand, has tended to depress the price rather unduly.

SALICYLIC has only been a moderately active market during the year; business started at about 3s. 6d. per lb. and the market advanced to 4s. by April, after which date it slowly declined and the figure now stands at about 2s. per lb.

TARTARIC was quite an active market during the early months of the year and some heavy contracts were placed. Business commenced at about 3s. 6d. per lb. on usual terms and advanced to 4s. 1d. per lb. in April. It has since steadily declined, until to-day the material can be obtained at about 2s. per lb., at which figure it is stated to be unremunerative to producers.

ALUM has been fairly steady throughout the year and makers have been well occupied; there has been little variation in price, but during the last month or two there has been a certain amount of competition from the Continent; this so far, however, has not affected the value.

ALUMINA SULPHATE has also been very steady and makers continue to be well occupied.

AMMONIUM SALTS have been fairly interesting, although latterly trade has shown a tendency to fall off considerably.

CHLORIDE has been fairly active and the market has continued firm until quite recently, when, owing to Continental offerings, values have fallen away somewhat.

CARBONATE. English makers were well occupied during the early part of the year, but recently business has been quiet; the price has been maintained, however, despite low prices from Germany.

PHOSPHATE has only been moderately active throughout the year and the price has been fairly steady; the value to-day may be taken at about £110 per ton.

ARSENIC has been in fair demand throughout the year and has not fluctuated to any great extent; business started in January at about £70 per ton, and the market advanced in March to £85 per ton. Since then the price has fluctuated and at the close the value may be taken at about £78. Foreign competition has been little in evidence.

BARIUM SALTS have been moderately active.

CHLORIDE has been a good market during the year, although latterly it has been somewhat depressed, and to-day stands at about £22 per ton. Nitrate has been more or less stagnant throughout the year and there are still heavy stocks on hand to be cleared off. The price, however, has been held up fairly well and to-day the value is about £40 per ton.

BLEACHING POWDER was an extremely active market during the early months of the year and supplies were extremely difficult to obtain. The market opened in January very firm at about £18 10s. per ton and steadily advanced until the value stood at about £32 per ton for export. During the last three or four months the demand has slackened, and the price of English-made material has dropped to about £26 per ton for export. There is a certain amount of Continental competition in evidence at a lower price, but the volume of business transacted in the competing material is not large.

COPPER SULPHATE has been a very unsatisfactory market throughout the year with practically no business passing, and the market closes as stagnant as it possibly can, and there appears to be little hope for the immediate future.

EPSOM SALTS have been a fairly steady market and some very good business was transacted during the early months of the year, latterly, however, German competition has been again in evidence on export account, but with the decline in the volume of trade only a relatively small amount of business has been transacted.

FORMALDEHYDE has been a fluctuating market throughout the year. Business commenced at about £200 per ton, at which figure it was practically unobtainable, supplies only coming to hand from America intermittently and the market jumped by leaps and bounds until by March it was standing in the neighbourhood of £350 per ton. At the beginning of May the value began to sag slightly and by August was slumping badly, but at the end of the year the value seems to have stabilised itself somewhat and may be taken to-day at £125 per ton, at which figure producers are not anxious sellers. An advance in price, therefore, may possibly be expected.

IRON SULPHATE has been only a moderately active market throughout the year and the price has remained fairly steady, production is moving off slowly and is standing to-day in the neighbourhood of £4 per ton ex works.

LEAD SALTS have been a disappointing market.

ACETATE commenced the year at about £100 for White, and the value has since slowly declined until to-day it can be taken at about £60 per ton. This latter figure is unremunerative to English makers and is caused in the main by German competition.

NITRATE has been more steady and commenced the year at £80 per ton, but it has declined in sympathy with the metal to the present value of £56 per ton. Business, however, has only been moderate.

LITHOPONE was very active at the beginning of the year and the price advanced sharply from £50 per ton to about £60 per ton by the end of March. This high value had the effect of reducing the consumption and with the decreasing demand the price fell away, until to-day it may be taken at about £42 per ton. Latterly, however, the demand seems to have increased and there seems to be a prospect of fairly active trade during the early months of next year.

POTASSIUM SALTS have been a fairly active market until comparatively recently.

BICHROMATE was very short in supply in the early months of the year. In January the value was about 1s. 11d. per lb. and it steadily advanced to about 2s. 3d. The price then fell away until to-day on the open market the material can be obtained at about 1s. 3d. per lb.

CARBONATE has been only in small request throughout the year and has been a slowly declining market, and to-day there are moderate supplies available at round about £75 per ton on the basis of 80 per cent.

CHLORIDE has likewise been a declining article and stands to-day at about £30 per ton.

PRUSSIATE has been quite a steady market throughout the year without violent fluctuations in value. The value in January was about 2s. 2d. per lb. and it has fallen away until to-day it stands at about 1s. 6d. per lb. with a fairly steady market.

CAUSTIC is now in much better supply and there are good supplies of Continental material available at round about £85 per ton for 80 per cent.

PERMANGANATE has been a fluctuating product and advanced from 4s. 3d. per lb. in January to about 5s. 3d. per lb. in May, since then the demand has fallen away and to-day there is only a very limited demand at round about 2s. 9d. per lb., and latterly there have been very good supplies of Continental material available.

SODIUM PRODUCTS have been very interesting and prices on the whole have followed the general trend of the market.

ACETATE has not fluctuated a great deal and the price varied from about £60 in January to about £65 per ton in May, and has since slowly declined and to-day the value is about £45 per ton. Business, on the whole, has been very fair throughout the year on this product.

ARSENIATES have moved very little in price during the year and the volume of business has not been so great as usual. There has been a falling off in the quantity exported.

BICARBONATE has been fairly active until the last month or two, the present value is about £14 per ton.

BICHROMATE was very badly wanted during the early part of the year on export account and the price advanced considerably to nearly 2s. per lb. for prompt material, since then the demand has fallen away and to-day's value is about 10d. per lb.

BISULPHITE is also a very interesting product, and the first half of the year manufacturers were not able to cope with the demand and the value as a result soared to about £50 per ton, latterly, however, in face of keen foreign competition the price has declined to the present value of about £36 per ton. Much of the foreign material ,however, cannot compete as regards quality with English produced material.

CHLORIDE has been very uninteresting throughout the

year and only a small volume of business has been transacted, the price is now about 5d. per lb.

CAUSTIC has been a pretty active market especially on export account, the value has varied for 70-72 per cent. from about £28 per ton in January, after which it rose to about £40 per ton, but with prevailing conditions the value is now about £26. American competition was very active in the early part of the year.

HYPOSULPHITE has been brisk throughout most of the year and at one time was in extremely short supply. Offers are now being made, however, of foreign material, and with the decreased demand in the country English makers are now well able to cope with the demand. To-day's value may be taken at about £24 per ton.

NITRITE has been an extremely fluctuating market, at the commencement of the year it was an extremely short supply and the price advanced very rapidly to the top figure of about £110 per ton. In the latter months of the year, however, demand has been extremely light, and with German competition the price has suffered considerably, so that to-day's value is only about £55 per ton.

PHOSPHATE has been moderately active and there has been little alteration in price, to-day the market is quiet at about £35 per ton.

YELLOW PRUSSIATE has not been so active as usual, except in the early months of the year, when there was a keen demand from America. Under the influence of this demand the price rose to about 1s. 10d. per lb. and is now round about 1s. per lb. with little business passing.

SULPHIDE has been a remarkably active article throughout most of the year, and most of the Continental markets have imported extremely large quantities. This country has been entirely unable to supply all the demand, and therefore a large amount of business was placed with America. Under the influence of the heavy demand the price steadily soared until £60 per ton was paid for Concentrated. In sympathy with most products, however, the article has since declined to more normal proportions, and the value may now be taken at £34 per ton for Concentrated and £22 per ton for Crystals.

SULPHITE has enjoyed a fairly interesting trade, mainly on Home account.

TIN SALTS have not been a very interesting market and the price has only moved in sympathy with the metal.

ZINC SALTS have been without any outstanding feature and prices have kept very steady in most of the products.

W. G. W.

# Reviews

BENZOL: ITS RECOVERY, RECTIFICATION AND USES. By S. E. Whitehead, B.Sc. London: Benn, Brothers, Ltd. pp. 203, 12s. 6d. net.

It cannot be said that Mr. Whitehead's book has come at the most opportune time. Unfortunately, it is about three years late, for it contains just the information which many of us hungered for in those probationary days of 1916 and 1917, when, by dint of supreme ingenuity, we managed to install both plant and process for benzol recovery with P.3 priorities and P.4 experience. One cannot, however, look for the impossible, for it was the last three years or so of the war which enabled the author to gather his knowledge of the recovery and rectification of benzene and its homologues; and as, under the Department of Explosives Supply, he held a roving commission, he has been able to collect together material for a volume of a highly practical and useful nature. The author has gained a good deal of his experience at the expense of the misfortunes of others. Though well understood by coke-oven establishments the practice of benzol stripping and the subsequent distillation of the wash-oil was quite foreign to the gas undertakings, although the latter boldly undertook to give of their utmost in the time of urgent national requirements. Mr. Whitehead acted in the capacity of a liaison officer between headquarters and individual producers, and there must be many of the latter who still look back with gratitude for the timely advice and helpful suggestions thrown out by him during his periodical visits to works in various parts of the country.

With the demands of war at an end the necessity for benzol recovery on a large scale ceased, so that many of the temporary plants are now closed down. As to their future no definite statement can as yet be made, but with the introduction of the Gas Regulation Bill it seems more likely than not that those responsible for gas manufacture will prefer to retain in the gas the most valuable heat-giving constituent which it contains. On the other hand, it is the plaint of every motorist that he can never get sufficient, if any, benzol, and the time may come when the increasingly powerful motoring interests gather sufficient strength as to persuade the Government to introduce compulsory "stripping." The question, necessarily, is purely an economic one, and it is a matter—but a complicated one—of deciding between the relative interests of the motorist and gas consumer.

Mr. Whitehead traverses clearly the whole subject from the theoretical principles and the preliminary treatment of the coal gas to the working up of the finished products and their numerous applications. His book is the only one of its kind, and should prove an indispensable vade-mecum, not only to those who still carry on benzol extraction, but also to those whose plant is for the moment standing idle.

A. M.

COAL IN GREAT BRITAIN: THE COMPOSITION, STRUCTURE AND RESOURCES OF THE COALFIELDS, VISIBLE AND CONCEALED, OF GREAT BRITAIN. By Walcot Gibson, D.Sc., F.G.S. (London, Edward Arnold, 1920. Pp. viii, 311. 21s.)

The literature on the coalfields of Great Britain is very scanty, and the output of books on coal in general seems to be inversely proportional to the economic and social importance of the subject. Dr. Walcot Gibson's book forms a welcome addition to the sources of information on the geological side of coal production. It is mainly intended to supply mining engineers, mine owners, and mining students with a concise account of the more important facts relating to the geology of coal generally and the composition, structure, and resources of the coalfields of Great Britain in particular. It will, however, also appeal to the chemist, whether he be dealing with the industrial aspects of the fuel question or the scientific investigation of the composition of coal.

The first eight chapters of the book are reproduced with many additions from the author's work on the geology of coal and coal mining published in 1908, and now out of print. The chapters of the early edition dealing with coal outside Great Britain have been omitted to make room for a detailed description of the coalfields of Wales, England, Scotland and Ireland. As the book is written almost entirely from the point of view of the geologist, the discussion of the chemical and physical properties of coal had to be compressed into a chapter of twelve pages, too small a space to do justice to the important problems involved. It must, however, be conceded that the author contrived to give those unfamiliar with the subject a bird's eye view sufficient to stimulate the interest of the reader and his thirst for further knowledge.

The research on coal during recent years might have been touched upon more freely. The purely geological portion of the book gives a great deal of information in very readable form, and is well illustrated by numerous sketch maps and sections of the various fields. The photographs of fossils found in the coal measures have been well reproduced. The author has drawn freely on the publications of the Geological Survey of the United Kingdom, and of the Federated Institute of Mining Engineers. One drawback of the book, of which mention must be made, is the complete omission of references to the literature. The student or general reader in search of more detailed information has to accept the author's statements without being given facilities for corroborating or correcting them by referring to the original source. The value of the book would be considerably enhanced if reference or a complete bibliography could be added to it in a future edition.

R. LESSING.

A large portion of the Derbyshire Silica Brickwork Co.'s premises at Friden, near Hartington, was destroyed by fire on Tuesday night. The flames were visible at a distance of ten miles.

# Regulations for Chemical Works

## New Draft Rules Under the Factory Act

THE Home Office has just issued under Section 79 of the Factory and Workshop Act, 1901, a new set of regulations applicable to manufactures and processes in chemical works. In addition to comprehensive provisions for rescue, safety, cookery, drinking, clothing, &c., the following are among the regulations affecting processes, plant, &c. :—

**Part I.**

1. With regard to every fixed vessel, whether pot, pan, vat, or other structure, containing any dangerous material, and not so covered as effectively to prevent the possibility of accidental immersion of any portion of the body of a person employed :—(*a*) Each such vessel shall, unless its edge is at least 3 feet above the adjoining ground or platform, be securely fenced to a height of at least 3 feet above such adjoining ground or platform. (*b*) No plank or gangway shall be placed across or inside any such vessel unless such plank or gangway is—(i) at least 18 inches wide ; and (ii) securely fenced on both sides ; either by upper and lower rails, to a height of 3 feet, or by other equally efficient means. (*c*) Where such vessels adjoin, and the space between them, clear of any surrounding brick or other work, is either (i) less than 18 inches in width, or (ii) is 18 or more inches in width, but is not securely fenced on both sides to a height of at least 3 feet, a secure barrier shall be so placed as to prevent passage between them.

Provided that paragraph (*a*) of this regulation shall not apply to brine evaporating pans if the drainage or other gallery above them is fenced to a height of 3 feet, or to saturators used in the manufacture of sulphate of ammonia.

3. The following processes shall not be carried on except under an efficient exhaust draught :—(*a*) drawing a charge from a salt-cake furnace or from a pyrites kiln ; (*b*) slaking of lime ; (*c*) any process involving action of acid on metal whereby there is a liability to the evolution of arseniuretted hydrogen.

4. All mills and screens for grinding and screening lime, and all mechanical conveyors used in connection therewith, shall be so enclosed as to prevent the escape of dust.

8. Before any person enters, for any purpose except that of rescue, any absorber, boiler, culvert, drain, flue, gas purifier, sewer, still, tank, tower, vitriol chamber, or other place where there is reason to apprehend the presence of dangerous gas or fumes, a responsible person appointed by the occupier for the purpose (*a*) shall see that such place is isolated and sealed from every source of such gas or fumes ; and (*b*) shall satisfy himself by a personal examination of the place that there is no danger to be apprehended from gas or fumes.

16. In all places where dangerous corrosive liquids are used (*a*) there shall be provided, for use in case of emergency : (i) Adequate and readily accessible means of flooding or drenching, with cold water, persons and the clothing of persons who have become splashed with such liquid ; (ii) a sufficient number of eye-wash bottles, filled with distilled water, or other suitable liquid, kept in boxes or cupboards conveniently situated and clearly indicated by a distinctive sign which shall be visible at all times, and nothing except the eye-wash bottles shall be kept in such boxes or cupboards.

**Part II.**

Applying to works or parts thereof in which : I. Caustic pots are used ; or II. Chlorate or bleaching powder is manufactured ; or III. (*a*) Gas tar or coal tar is distilled or is used in any process of chemical manufacture ; or (*b*) Synthetic colouring matters or their intermediates are made ; or (*c*) A nitro or amido process is carried on ; or (*d*) A chrome process is carried on ; or IV. Shale oil is refined or is used in any process of chemical manufacture ; or V. Nitric acid is used in the manufacture of nitro compounds.

24. Every caustic pot shall be of such construction that there shall be no foothold on the top or sides of the brickwork or flues ; and the edge of every such pot constructed, rebuilt or replaced after these Regulations come into force shall be at least 3 feet in height above the adjoining ground or platform.

25. Before any person enters a coal or gas tar still for any purpose except that of rescue, it shall be completely isolated from adjoining tar stills, either by disconnecting (*a*) The pipe leading from the swan neck to the condenser worm, or (*b*) The waste gas pipe fixed to the worm end or receiver, and in addition blank flanges shall be inserted between the disconnected parts, and the pitch discharge pipe or cock at the bottom of the still shall be disconnected.

26. No person shall enter a chamber for the purpose of withdrawing the charge of bleaching powder unless and until (i) The chamber is efficiently ventilated, and (ii) The air in the chamber has been tested and found to contain not more than 2.5 grains of free chlorine gas per cubic foot. A register containing details of all such tests shall be kept in a form approved by the Chief Inspector of Factories.

27. In a nitro or amido process :—(*a*) If crystallised substances are broken or any liquor agitated by hand, means shall be taken to prevent, as far as practicable the inhalation of dust or fumes. The handles of all implements used in the operations shall be cleansed daily. (*b*) Cartridges shall not be filled by hand except by means of a suitable scoop ; (*c*) Every drying stove shall be efficiently ventilated to the outside air in such a manner that hot air from the stove shall not be drawn into any workroom ; (*d*) No person shall enter a stove to remove the contents until a free current of air has been passed through it. (*e*) Every vessel containing nitro or amido derivatives of phenol or of benzene or its homologues shall, if steam is passed into or around it, or if the temperature of the contents be at or above the temperature of boiling water, be covered in such a way that steam or vapour shall be discharged into the open air at a height of not less than 20 feet from the ground, and at a point where it cannot be blown back again into the workroom. (*f*) In every room in which dust is generated or fumes are evolved an efficient exhaust draught shall be provided.

28. (*a*) Every machine used for grinding or crushing caustic shall be enclosed, and (*b*) Where any of the following processes are carried on :—(i) Grinding or crushing of caustic ; (ii) Packing of ground caustic ; (iii) Grinding, sieving, evaporating or packing in a chrome process ; (iv) Crushing, grinding or mixing of material or cartridge filling in a nitro or amido process ; an efficient exhaust draught shall be provided.

29. (*a*) Chlorate shall not be crystallised, ground or packed except in a room or place not used for any other purpose, the floor of which room or place shall be of cement or other smooth, impervious and incombustible material, and shall be washed or sprinkled with water, and swept daily.

(*b*) Wooden vessels shall not be used for the crystallisation of chlorate, or to contain crystallised or ground chlorate ; provided that this Regulation shall not prohibit the packing of chlorate for sale into wooden casks or other wooden vessels.

30. No person under 18 years of age shall be employed in a chrome process or in a nitro or amido process.

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LOW TEMPERATURE CARBONISATION.—A balance-sheet which covers the period from incorporation to December 31, 1919, and include the assets and undertakings of Coalite, Ltd., and British Coalite, Ltd., has been submitted. In June, 1919, Low Temperature Carbonisation, Ltd., was converted into a public company, and subsequently the directors acquired Coalite, Ltd., and British Coalite, Ltd., on the basis of an exchange of preference shares and debenture stock. This amalgamation of the financial, technical, and commercial interests formed to develop the process of carbonising coal at low temperature established the company as the largest and most important undertaking of its kind in the world. A technical and commercial staff is engaged in preparing designs for new plants. The results obtained from the plant at Barnsley, where new retorts have been installed, are entirely satisfactory, and enable the directors to state that the engineering problems of low temperature carbonisation are in effect solved. Further extensions are in progress, and several commercial undertakings are at the moment carrying out investigations with a view to adopting the company's patents and processes.

# The Fourth Dimension and Some Conceptions of Matter

By Roy Franklin Heath

What relation exists between hyperspace and the unity-genesis of matter and its correlated phenomena? Modern conceptions of matter and energy tend to prove, but at the same time simplify, what formerly was considered absurd.

The greatest trouble is often experienced in trying to conceive the possibility of the fourth dimension without the use of the imaginative faculties, while there are many who say that the fourth dimension is a mathematical delusion, only a mental reality, while others flatly deny its possibility. It cannot be denied but what an assumption of the fourth dimension would aid in clarifying many of the unexplained scientific mysteries.

To get a firm foundation concerning matter, let us consider the molecule the smallest part of a compound, or a union of two atoms, an atom being the smallest part of an element that can still retain its characteristic identity or properties. An ion is the smallest complete part of an atom, being composed of a nucleus around which is oscillating the ultra-ion. Many thousands or millions of these complete ions are necessary to form a single atom of matter, therefore it is obvious that matter is in a high but variable state of vibration. According to the late Sir William Crookes, the difference of pitch or vibrating frequency of the ions present was responsible for the characteristics of atoms. This theory would place matter on the evolutional basis.

According to the above explanation involving the principle facts concerning matter that are fully, but probably imperfectly, understood, energy is ionic or ultra-ionic matter in motion, there being a correlative variation in regard to the different forms of energy, being generally admitted to be of electrical origin or electricity itself, but regarding the real aspect and nature nothing is positively known except through its manifestations.

One of the reasons why the fourth dimension is a baffling problem is that it is hard to conceive, to fully apprehend, in this regard the analogy of matter from molecules to ultra-ions can readily be conceived, and a clear conception established concerning it. On the other hand, fourth dimension being ordinarily dealing with space and hyperspace, a review of a few definitions will show the vagueness upon which the conception of the fourth dimension must be established.

Harris states Aristotle's idea regarding space as being, "that without which bodies could not exist, but itself (space) continuing to exist when bodies cease to exist." Space possesses magnitude or extension though itself is not a body, for in case it were a body, then two bodies would exist in the same place. Enclosed places may be contained and moved in larger including places, such as a ball in a box, the box in a house, the house in a town, the town on the earth, &c., but all places are in one continuous space, an ultimate environment which contains all movable things and is not movable itself.

### The Ether of Space

The ether of space is a term so commonly employed in reference to the wave theory of light, that from a study of their similarities they are analogous, if not identical. "The ether must be assumed to occupy not only space which is otherwise void, but also space filled with ordinary matter. It is itself not cognisable by the senses, and is not ordinary matter. It is only material in so far as it is associated with energy and transmits it. It is assumed to be frictionless, at least to such

appreciated by the individual possessing a clear conception of the terms "space," "ether," or "ether of space." This does not necessarily infer that individuals must possess the same view concerning the ether of space; but, to solve the baffling speculation, some secure foundation must be established before the possibilities of the fourth dimension can be proven to exist.

Having formed some conception regarding space, the logical question to follow would be—Does a hyperspace exist, or can the fourth dimension come within the realm of the ether of space, without postulating a hypothesis involving hyperspace? From an empirical standpoint, space has its limitations in three dimensions, but there is nothing inconsistent with any scientific facts to prove that the four dimensions cannot exist within the limits of space. For this reason, if the fourth dimension is capable of existing, it exists within perceptible space, but we cannot conceive or, because of the lack of certain senses, cannot apprehend it as such; hence the expression the fourth dimension existing in hyperspace.

A few general facts primarily beginning with Euclid's definition of a point, which states that it has no parts and no magnitude, and ending with the tesser-cuboid, will be concisely mentioned. A straight line drawn from a point represents one dimension (Fig. 1); if we proceed to draw a line at right angle to the straight line we have two dimensions (Fig. 2); the square is doubled and lines drawn at right angles from the corners result in a cube or three dimensions (Fig. 3). Here are represented the three traditional cherishes of dimension,

Fig.1.

Fig.2.

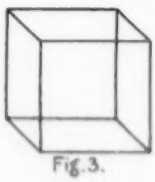

Fig.3.

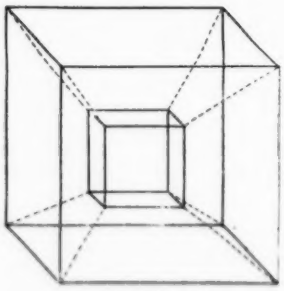

Fig.4.

length, breadth, and thickness. What next? Now, if it would be possible to move the cube out of itself, through right angles, the tesser-cuboid would result, as is illustrated in Fig. 4. Because the fourth dimension has not been actually proven it must be assumed that, when this state is reached, the object becomes invisible to those of three dimensions, but would, however, become visible to those existing within the realm of the fourth dimension if such is the case.

Another example which illustrates fourth dimension on the physical plane [illegible]

The ether of space is, no doubt, the Sphinx which holds the mystery of matter and the cosmos. From data gathered from the latest discoveries in the physical and allied sciences, it is that invisible beginning of physical matter, still the storehouse of potential energy, which is responsible for life and all its accompanying phenomena.

As for the real and practical value, outside of mental exercise, the study of the fourth-dimension possibilities is of little service; it is like any theory based upon an assumption or prejudice, and is at its best only a hypothesis. Still, it does aid in offering solutions of many of the scientific phenomena which, without it, would be difficult to explain. Among some of the phenomena which can be explained through the existence of the fourth dimension, which without it are difficult to postulate, are the allotropic states, *i.e.*, crystallisation, amorphorous conditions, isomerisms, catalyses, the variance of atomic force and radioactivity, gaseous states, polarisation of light; while Professor Hinton has come to the conclusion that four dimensional vertices explain the electric current and probably all or many other forms of energy. Professor McKendrick a few years ago stated before the British Association that, "It is conceivable that life may be the transmission to dead matter . . . of a form of motion *sui generis*."

Professor Einstein's theory of relativity has probably been one of the greatest theories based upon experimental evidence that has been promulgated in recent years. In this system, Professor Einstein holds that time is the fourth dimension, not in the ordinary conception, however, simply being designed as one of the variables of the four dimensional continuim. Considering time as one of the components of time-space, then up-and-down, left-and-right, backward and forward, and sooner and later represent the complete rôle of a four-dimensional time-space.

### Conclusion

Will actual proof ever be presented in a concrete form to prove the existence of a fourth dimension? Undoubtedly the future will see the time when this baffling mystery will be solved, just as modern science has overcome the former obstacles in the path of civilisation and progress. When this is accomplished the true inner workings of nature's mysterious universe will unfold itself. Would not the benefit to which the use of the knowledge so derived be of inestimable value? Utilisation of the tremendous latent power of matter might be solved. Gold could, no doubt, be made as cheap as aluminium, while silver might become as common as tin. Platinum would become so common that it could be used in place of nickel, all other rarer elements produced from the invisible "etheric-flux," the unity-atom, or the "primodorial" substance. Such is within the realm of the possible if the fourth dimension has a physical existence; but, as Dr. Le Bon states, "the discoverer of the liberation of intra-atomic energy will probably not survive to witness the success of his experiment," or, as Professor Rutherford says, "Such success might conceivably 'dump-off' the whole earth itself," and, as J. J. Hunter Johnson observes, "convert the present fermenting mass of rancour and evil passions into a writhing cloud of—what? One wonders."

As absurd as the subject may seem, to many it is nevertheless of great scientific interest, and no greater progress could be made than in such a field, truly in its first infancy.

# The Dawson Sulphuric Acid Plant

**By H. Royal Dawson, A.I.C.**

A FEATURE of sulphuric acid plant construction in the past four years has been the introduction of tower systems. With the old but well-tried chamber process 20 cubic feet of chamber capacity per lb. of sulphur was considered a normal allowance, but with the newer systems this has been reduced to 11 and even 7 cubic feet. The reduction has been attained in a variety of ways, but mainly by the introduction between each chamber of towers fed by weak acid.

In order to save land space, and reduce a plant to that size which will do the same equivalent of work on the intensive system, the diagram (Fig. 1) shows "towers," preferably

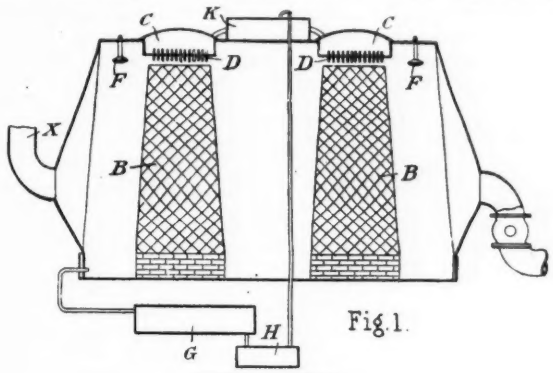

Fig. 1.

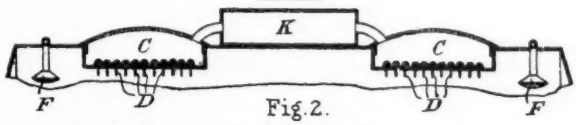

Fig. 2.

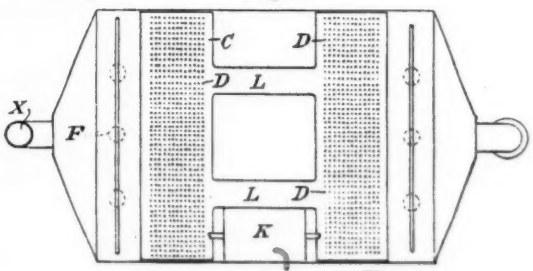

Fig. 3.

called barriers, erected inside the chamber with the object of acting as washers or scrubbers of the mixed gases as they pass through the process.

From the diagram it will be seen that the gases entering the inlet X coming in contact with surfaces B, which are kept moist, set up an accelerated action when meeting a counter flow of liquid fed from reservoirs sunken into the chamber top C. The feed liquor is taken from the bottom chamber acid, and, after cooling, is run into acid elevator H. Although the spray system is used for atomised water or acid this may be

year and only a small volume of business has been transacted, the price is now about 5d. per lb.

CAUSTIC has been a pretty active market especially on export account, the value has varied for 70-72 per cent. from about £28 per ton in January, after which it rose to about £40 per ton, but with prevailing conditions the value is now about £26. American competition was very active in the early part of the year.

HYPOSULPHITE has been brisk throughout most of the year and at one time was in extremely short supply. Offers are now being made, however, of foreign material, and with the decreased demand in the country English makers are now well able to cope with the demand. To-day's value may be taken at about £24 per ton.

NITRITE has been an extremely fluctuating market, at the commencement of the year it was an extremely short supply and the price advanced very rapidly to the top figure of about £110 per ton. In the latter months of the year, however, demand has been extremely light, and with German competition the price has suffered considerably, so that to-day's value is only about £55 per ton.

PHOSPHATE has been moderately active and there has been little alteration in price, to-day the market is quiet at about £35 per ton.

YELLOW PRUSSIATE has not been so active as usual, except in the early months of the year, when there was a keen demand from America. Under the influence of this demand the price rose to about 1s. 10d. per lb. and is now round about 1s. per lb. with little business passing.

SULPHIDE has been a remarkably active article throughout most of the year, and most of the Continental markets have imported extremely large quantities. This country has been entirely unable to supply all the demand, and therefore a large amount of business was placed with America. Under the influence of the heavy demand the price steadily soared until £60 per ton was paid for Concentrated. In sympathy with most products, however, the article has since declined to more normal proportions, and the value may now be taken at £34 per ton for Concentrated and £22 per ton for Crystals.

SULPHITE has enjoyed a fairly interesting trade, mainly on Home account.

TIN SALTS have not been a very interesting market and the price has only moved in sympathy with the metal.

ZINC SALTS have been without any outstanding feature and prices have kept very steady in most of the products.

W. G. W.

# Reviews

BENZOL: ITS RECOVERY, RECTIFICATION AND USES. By S. E. Whitehead, B.Sc. London: Benn, Brothers, Ltd. pp. 203, 12s. 6d. net.

It cannot be said that Mr. Whitehead's book has come at the most opportune time. Unfortunately, it is about three years late, for it contains just the information which many of us hungered for in those probationary days of 1916 and 1917, when, by dint of supreme ingenuity, we managed to install both plant and process for benzol recovery with P.3 priorities and P.4 experience. One cannot, however, look for the impossible, for it was the last three years or so of the war which enabled the author to gather his knowledge of the recovery and rectification of benzene and its homologues; and as, under the Department of Explosives Supply, he held a roving commission, he has been able to collect together material for a volume of a highly practical and useful nature. The author has gained a good deal of his experience at the expense of the misfortunes of others. Though well understood by coke-oven establishments the practice of benzol stripping and the subsequent distillation of the wash-oil was quite foreign to the gas undertakings, although the latter boldly undertook to give of their utmost in the time of urgent national requirements. Mr. Whitehead acted in the capacity of a liaison officer between headquarters and individual producers, and there must be many of the latter who still look back with gratitude for the timely advice and helpful suggestions thrown out by him during his periodical visits to works in various parts of the country.

With the demands of war at an end the necessity for benzol recovery on a large scale ceased, so that many of the temporary plants are now closed down. As to their future no definite statement can as yet be made, but with the introduction of the Gas Regulation Bill it seems more likely than not that those responsible for gas manufacture will prefer to retain in the gas the most valuable heat-giving constituent which it contains. On the other hand, it is the plaint of every motorist that he can never get sufficient, if any, benzol, and the time may come when the increasingly powerful motoring interests gather sufficient strength as to persuade the Government to introduce compulsory "stripping." The question, necessarily, is purely an economic one, and it is a matter—but a complicated one—of deciding between the relative interests of the motorist and gas consumer.

Mr. Whitehead traverses clearly the whole subject from the theoretical principles and the preliminary treatment of the coal gas to the working up of the finished products and their numerous applications. His book is the only one of its kind, and should prove an indispensable vade-mecum, not only to those who still carry on benzol extraction, but also to those whose plant is for the moment standing idle.

A. M.

COAL IN GREAT BRITAIN: THE COMPOSITION, STRUCTURE AND RESOURCES OF THE COALFIELDS, VISIBLE AND CONCEALED, OF GREAT BRITAIN. By Walcot Gibson, D.Sc., F.G.S. (London, Edward Arnold, 1920. Pp. viii, 311. 21s.)

The literature on the coalfields of Great Britain is very scanty, and the output of books on coal in general seems to be inversely proportional to the economic and social importance of the subject. Dr. Walcot Gibson's book forms a welcome addition to the sources of information on the geological side of coal production. It is mainly intended to supply mining engineers, mine owners, and mining students with a concise account of the more important facts relating to the geology of coal generally and the composition, structure, and resources of the coalfields of Great Britain in particular. It will, however, also appeal to the chemist, whether he be dealing with the industrial aspects of the fuel question or the scientific investigation of the composition of coal.

The first eight chapters of the book are reproduced with many additions from the author's work on the geology of coal and coal mining published in 1908, and now out of print. The chapters of the early edition dealing with coal outside Great Britain have been omitted to make room for a detailed description of the coalfields of Wales, England, Scotland and Ireland. As the book is written almost entirely from the point of view of the geologist, the discussion of the chemical and physical properties of coal had to be compressed into a chapter of twelve pages, too small a space to do justice to the important problems involved. It must, however, be conceded that the author contrived to give those unfamiliar with the subject a bird's eye view sufficient to stimulate the interest of the reader and his thirst for further knowledge.

The research on coal during recent years might have been touched upon more freely. The purely geological portion of the book gives a great deal of information in very readable form, and is well illustrated by numerous sketch maps and sections of the various fields. The photographs of fossils found in the coal measures have been well reproduced. The author has drawn freely on the publications of the Geological Survey of the United Kingdom, and of the Federated Institute of Mining Engineers. One drawback of the book, of which mention must be made, is the complete omission of references to the literature. The student or general reader in search of more detailed information has to accept the author's statements without being given facilities for corroborating or correcting them by referring to the original source. The value of the book would be considerably enhanced if reference or a complete bibliography could be added to it in a future edition.

R. LESSING.

A large portion of the Derbyshire Silica Brickwork Co.'s premises at Friden, near Hartington, was destroyed by fire on Tuesday night. The flames were visible at a distance of ten miles.

# Regulations for Chemical Works

## New Draft Rules Under the Factory Act

THE Home Office has just issued under Section 79 of the Factory and Workshop Act, 1901, a new set of regulations applicable to manufactures and processes in chemical works. In addition to comprehensive provisions for rescue, safety, cookery, drinking, clothing, &c., the following are among the regulations affecting processes, plant, &c. :—

**Part I.**

1. With regard to every fixed vessel, whether pot, pan, vat, or other structure, containing any dangerous material, and not so covered as effectively to prevent the possibility of accidental immersion of any portion of the body of a person employed :—(*a*) Each such vessel shall, unless its edge is at least 3 feet above the adjoining ground or platform, be securely fenced to a height of at least 3 feet above such adjoining ground or platform. (*b*) No plank or gangway shall be placed across or inside any such vessel unless such plank or gangway is—(i) at least 18 inches wide ; and (ii) securely fenced on both sides ; either by upper and lower rails, to a height of 3 feet, or by other equally efficient means. (*c*) Where such vessels adjoin, and the space between them, clear of any surrounding brick or other work, is either (i) less than 18 inches in width, or (ii) is 18 or more inches in width, but is not securely fenced on both sides to a height of at least 3 feet, a secure barrier shall be so placed as to prevent passage between them.

Provided that paragraph (*a*) of this regulation shall not apply to brine evaporating pans if the drainage or other gallery above them is fenced to a height of 3 feet, or to saturators used in the manufacture of sulphate of ammonia.

3. The following processes shall not be carried on except under an efficient exhaust draught :—(*a*) drawing a charge from a salt-cake furnace or from a pyrites kiln ; (*b*) slaking of lime ; (*c*) any process involving action of acid on metal whereby there is a liability to the evolution of arseniuretted hydrogen.

4. All mills and screens for grinding and screening lime, and all mechanical conveyors used in connection therewith, shall be so enclosed as to prevent the escape of dust.

8. Before any person enters, for any purpose except that of rescue, any absorber, boiler, culvert, drain, flue, gas purifier, sewer, still, tank, tower, vitriol chamber, or other place where there is reason to apprehend the presence of dangerous gas or fumes, a responsible person appointed by the occupier for the purpose (*a*) shall see that such place is isolated and sealed from every source of such gas or fumes ; and (*b*) shall satisfy himself by a personal examination of the place that there is no danger to be apprehended from gas or fumes.

16. In all places where dangerous corrosive liquids are used (*a*) there shall be provided, for use in case of emergency : (i) Adequate and readily accessible means of flooding or drenching, with cold water, persons and the clothing of persons who have become splashed with such liquid ; (ii) a sufficient number of eye-wash bottles, filled with distilled water, or other suitable liquid, kept in boxes or cupboards conveniently situated and clearly indicated by a distinctive sign which shall be visible at all times, and nothing except the eye-wash bottles shall be kept in such boxes or cupboards.

**Part II.**

Applying to works or parts thereof in which : I. Caustic pots are used ; or II. Chlorate or bleaching powder is manufactured ; or III. (*a*) Gas tar or coal tar is distilled or is used in any process of chemical manufacture ; or (*b*) Synthetic colouring matters or their intermediates are made ; or (*c*) A nitro or amido process is carried on ; or (*d*) A chrome process is carried on ; or IV. Shale oil is refined or is used in any process of chemical manufacture ; or V. Nitric acid is used in the manufacture of nitro compounds.

24. Every caustic pot shall be of such construction that there shall be no foothold on the top or sides of the brickwork or flues ; and the edge of every such pot constructed, rebuilt or replaced after these Regulations come into force shall be at least 3 feet in height above the adjoining ground or platform.

25. Before any person enters a coal or gas tar still for any purpose except that of rescue, it shall be completely isolated from adjoining tar stills, either by disconnecting (*a*) The pipe leading from the swan neck to the condenser worm, or (*b*) The waste gas pipe fixed to the worm end or receiver, and in addition blank flanges shall be inserted between the disconnected parts, and the pitch discharge pipe or cock at the bottom of the still shall be disconnected.

26. No person shall enter a chamber for the purpose of withdrawing the charge of bleaching powder unless and until (i) The chamber is efficiently ventilated, and (ii) The air in the chamber has been tested and found to contain not more than 2.5 grains of free chlorine gas per cubic foot. A register containing details of all such tests shall be kept in a form approved by the Chief Inspector of Factories.

27. In a nitro or amido process :—(*a*) If crystallised substances are broken or any liquor agitated by hand, means shall be taken to prevent, as far as practicable the inhalation of dust or fumes. The handles of all implements used in the operations shall be cleansed daily. (*b*) Cartridges shall not be filled by hand except by means of a suitable scoop ; (*c*) Every drying stove shall be efficiently ventilated to the outside air in such a manner that hot air from the stove shall not be drawn into any workroom ; (*d*) No person shall enter a stove to remove the contents until a free current of air has been passed through it. (*e*) Every vessel containing nitro or amido derivatives of phenol or of benzene or its homologues shall, if steam is passed into or around it, or if the temperature of the contents be at or above the temperature of boiling water, be covered in such a way that steam or vapour shall be discharged into the open air at a height of not less than 20 feet from the ground, and at a point where it cannot be blown back again into the workroom. (*f*) In every room in which dust is generated or fumes are evolved an efficient exhaust draught shall be provided.

28. (*a*) Every machine used for grinding or crushing caustic shall be enclosed, and (*b*) Where any of the following processes are carried on :—(i) Grinding or crushing of caustic ; (ii) Packing of ground caustic ; (iii) Grinding, sieving, evaporating or packing in a chrome process ; (iv) Crushing, grinding or mixing of material or cartridge filling in a nitro or amido process ; an efficient exhaust draught shall be provided.

29. (*a*) Chlorate shall not be crystallised, ground or packed except in a room or place not used for any other purpose, the floor of which room or place shall be of cement or other smooth, impervious and incombustible material, and shall be washed or sprinkled with water, and swept daily.

(*b*) Wooden vessels shall not be used for the crystallisation of chlorate, or to contain crystallised or ground chlorate ; provided that this Regulation shall not prohibit the packing of chlorate for sale into wooden casks or other wooden vessels.

30. No person under 18 years of age shall be employed in a chrome process or in a nitro or amido process.

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LOW TEMPERATURE CARBONISATION.—A balance-sheet which covers the period from incorporation to December 31, 1919, and include the assets and undertakings of Coalite, Ltd., and British Coalite, Ltd., has been submitted. In June, 1919, Low Temperature Carbonisation, Ltd., was converted into a public company, and subsequently the directors acquired Coalite, Ltd., and British Coalite, Ltd., on the basis of an exchange of preference shares and debenture stock. This amalgamation of the financial, technical, and commercial interests formed to develop the process of carbonising coal at low temperature established the company as the largest and most important undertaking of its kind in the world. A technical and commercial staff is engaged in preparing designs for new plants. The results obtained from the plant at Barnsley, where new retorts have been installed, are entirely satisfactory, and enable the directors to state that the engineering problems of low temperature carbonisation are in effect solved. Further extensions are in progress, and several commercial undertakings are at the moment carrying out investigations with a view to adopting the company's patents and processes.

# The Fourth Dimension and Some Conceptions of Matter

By Roy Franklin Heath

WHAT relation exists between hyperspace and the unity-genesis of matter and its correlated phenomena? Modern conceptions of matter and energy tend to prove, but at the same time simplify, what formerly was considered absurd.

The greatest trouble is often experienced in trying to conceive the possibility of the fourth dimension without the use of the imaginative faculties, while there are many who say that the fourth dimension is a mathematical delusion, only a mental reality, while others flatly deny its possibility. It cannot be denied but what an assumption of the fourth dimension would aid in clarifying many of the unexplained scientific mysteries.

To get a firm foundation concerning matter, let us consider the molecule the smallest part of a compound, or a union of two atoms, an atom being the smallest part of an element that can still retain its characteristic identity or properties. An ion is the smallest complete part of an atom, being composed of a nucleus around which is oscillating the ultra-ion. Many thousands or millions of these complete ions are necessary to form a single atom of matter, therefore it is obvious that matter is in a high but variable state of vibration. According to the late Sir William Crookes, the difference of pitch or vibrating frequency of the ions present was responsible for the characteristics of atoms. This theory would place matter on the evolutional basis.

According to the above explanation involving the principle facts concerning matter that are fully, but probably imperfectly, understood, energy is ionic or ultra-ionic matter in motion, there being a correlative variation in regard to the different forms of energy, being generally admitted to be of electrical origin or electricity itself, but regarding the real aspect and nature nothing is positively known except through its manifestations.

One of the reasons why the fourth dimension is a baffling problem is that it is hard to conceive, to fully apprehend, in this regard the analogy of matter from molecules to ultra-ions can readily be conceived, and a clear conception established concerning it. On the other hand, fourth dimension being ordinarily dealing with space and hyperspace, a review of a few definitions will show the vagueness upon which the conception of the fourth dimension must be established.

Harris states Aristotle's idea regarding space as being, "that without which bodies could not exist, but itself (space) continuing to exist when bodies cease to exist." Space possesses magnitude or extension though itself is not a body, for in case it were a body, then two bodies would exist in the same place. Enclosed places may be contained and moved in larger including places, such as a ball in a box, the box in a house, the house in a town, the town on the earth, &c., but all places are in one continuous space, an ultimate environment which contains all movable things and is not movable itself.

### The Ether of Space

The ether of space is a term so commonly employed in reference to the wave theory of light, that from a study of their similarities they are analogous, if not identical. "The ether must be assumed to occupy not only space which is otherwise void, but also space filled with ordinary matter. It is itself not cognisable by the senses, and is not ordinary matter. It is only material in so far as it is associated with energy and transmits it. It is assumed to be frictionless, at least to such a degree that slowly moving bodies, like planets, pass through it without retardation. . . . The difficulty of obtaining any adequate conception of the ether is still insuperable" ("Magie Princ. of Phy.," 357, 343). Hoadley presents the following brief descriptive conception on the nature of ether, "Ether pervades all space. It is elastic and rigid, and is capable of displacement and exerting pressure. It may be considered as a universal jelly, so thin as to pass readily through every known substance, and to permit the densest substance to pass through it as a sieve passes through the air, a jelly so thin that it has no appreciable weight and has caused no measurable change in the velocity of any heavenly body." ("El. of Phy.," 218, 223.)

The theory of fourth dimension can only be fully appreciated by the individual possessing a clear conception of the terms "space," "ether," or "ether of space." This does not necessarily infer that individuals must possess the same view concerning the ether of space; but, to solve the baffling speculation, some secure foundation must be established before the possibilities of the fourth dimension can be proven to exist.

Having formed some conception regarding space, the logical question to follow would be—Does a hyperspace exist, or can the fourth dimension come within the realm of the ether of space, without postulating a hypothesis involving hyperspace? From an empirical standpoint, space has its limitations in three dimensions, but there is nothing inconsistent with any scientific facts to prove that the four dimensions cannot exist within the limits of space. For this reason, if the fourth dimension is capable of existing, it exists within perceptible space, but we cannot conceive or, because of the lack of certain senses, cannot apprehend it as such; hence the expression the fourth dimension existing in hyperspace.

A few general facts primarily beginning with Euclid's definition of a point, which states that it has no parts and no magnitude, and ending with the tesser-cuboid, will be concisely mentioned. A straight line drawn from a point represents one dimension (Fig. 1); if we proceed to draw a line at right angle to the straight line we have two dimensions (Fig. 2); the square is doubled and lines drawn at right angles from the corners result in a cube or three dimensions (Fig. 3). Here are represented the three traditional cherishes of dimension,

Fig.1.

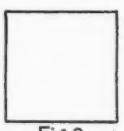

Fig.2.

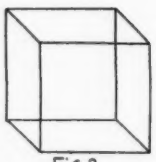

Fig.3.

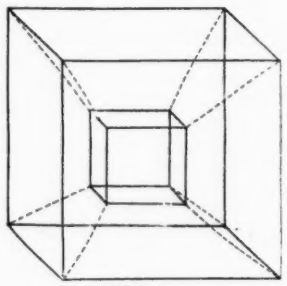

Fig.4.

length, breadth, and thickness. What next? Now, if it would be possible to move the cube out of itself, through right angles, the tesser-cuboid would result, as is illustrated in Fig. 4. Because the fourth dimension has not been actually proven it must be assumed that, when this state is reached, the object becomes invisible to those of three dimensions, but would, however, become visible to those existing within the realm of the fourth dimension if such is the case.

Another example which illustrates fourth dimension on the physical plane (if the particles of smoke do not intermix) is that of a ring of smoke. The ring rotates in two directions, the inner edge becoming the outer, while the outer edge assumes the inner position. From only a three-dimensional view, is not this absurd? Still, it can be mathematically explained, as also can a ball be turned outside-in without breaking the surface.

### Influence in Science

No attempt will be made to offer any form of mathematical proof of the fourth dimension in this brief article. The interest that the fourth dimension exerts in all branches of science is of as great, if not of greater, interest than in mathematics itself. In the correlation of the forces and an increased knowledge concerning the nature of matter, the fourth dimension exerts its greatest influence.

The ether of space is, no doubt, the Sphinx which holds the mystery of matter and the cosmos. From data gathered from the latest discoveries in the physical and allied sciences, it is that invisible beginning of physical matter, still the storehouse of potential energy, which is responsible for life and all its accompanying phenomena.

As for the real and practical value, outside of mental exercise, the study of the fourth-dimension possibilities is of little service; it is like any theory based upon an assumption or prejudice, and is at its best only a hypothesis. Still, it does aid in offering solutions of many of the scientific phenomena which, without it, would be difficult to explain. Among some of the phenomena which can be explained through the existence of the fourth dimension, which without it are difficult to postulate, are the allotropic states, *i.e.*, crystallisation, amorphorous conditions, isomerisms, catalyses, the variance of atomic force and radioactivity, gaseous states, polarisation of light; while Professor Hinton has come to the conclusion that four dimensional vertices explain the electric current and probably all or many other forms of energy. Professor McKendrick a few years ago stated before the British Association that, "It is conceivable that life may be the transmission to dead matter . . . of a form of motion *sui generis*."

Professor Einstein's theory of relativity has probably been one of the greatest theories based upon experimental evidence that has been promulgated in recent years. In this system, Professor Einstein holds that time is the fourth dimension, not in the ordinary conception, however, simply being designed as one of the variables of the four dimensional continuim. Considering time as one of the components of time-space, then up-and-down, left-and-right, backward and forward, and sooner and later represent the complete rôle of a four-dimensional time-space.

### Conclusion

Will actual proof ever be presented in a concrete form to prove the existence of a fourth dimension? Undoubtedly the future will see the time when this baffling mystery will be solved, just as modern science has overcome the former obstacles in the path of civilisation and progress. When this is accomplished the true inner workings of nature's mysterious universe will unfold itself. Would not the benefit to which the use of the knowledge so derived be of inestimable value? Utilisation of the tremendous latent power of matter might be solved. Gold could, no doubt, be made as cheap as aluminium, while silver might become as common as tin. Platinum would become so common that it could be used in place of nickel, all other rarer elements produced from the invisible "etheric-flux," the unity-atom, or the "primodorial" substance. Such is within the realm of the possible if the fourth dimension has a physical existence; but, as Dr. Le Bon states, "the discoverer of the liberation of intra-atomic energy will probably not survive to witness the success of his experiment," or, as Professor Rutherford says, "Such success might conceivably 'dump-off' the whole earth itself," and, as J. J. Hunter Johnson observes, "convert the present fermenting mass of rancour and evil passions into a writhing cloud of—what? One wonders."

As absurd as the subject may seem, to many it is nevertheless of great scientific interest, and no greater progress could be made than in such a field, truly in its first infancy.

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Petrohol, a new alcohol, is being made from the by-products of petroleum refinement by the Standard Oil Company of New Jersey.

Uruguay proposes to establish a sulphuric acid factory capable of producing 25,000 kilos of acid daily; a nitric acid factory with a capacity of 10,000 to 15,000 kilos daily; a factory for the production of crude benzol, toluol, xylol and carbolic acid; a caustic soda factory on the electrolytic system, yielding as by-products chlorine and hydrogen, and producing a ton of caustic soda daily; a factory for the production of alcohol and sulphuric ether; works for the production of acetic acid, glycerine and the preparation of cotton; a powder and explosive factory. A Bill has been submitted to the Administrative Council. The approximate total cost of these works is estimated at 2,180,000 pesos.

## The Dawson Sulphuric Acid Plant

**By H. Royal Dawson, A.I.C.**

A FEATURE of sulphuric acid plant construction in the past four years has been the introduction of tower systems. With the old but well-tried chamber process 20 cubic feet of chamber capacity per lb. of sulphur was considered a normal allowance, but with the newer systems this has been reduced to 11 and even 7 cubic feet. The reduction has been attained in a variety of ways, but mainly by the introduction between each chamber of towers fed by weak acid.

In order to save land space, and reduce a plant to that size which will do the same equivalent of work on the intensive system, the diagram (Fig. 1) shows "towers," preferably

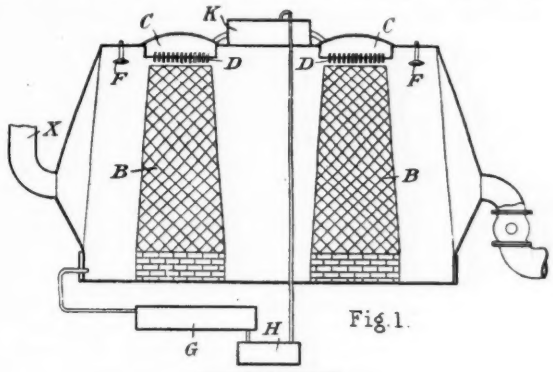
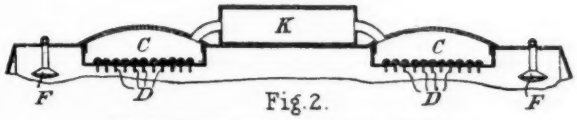


Fig. 1.



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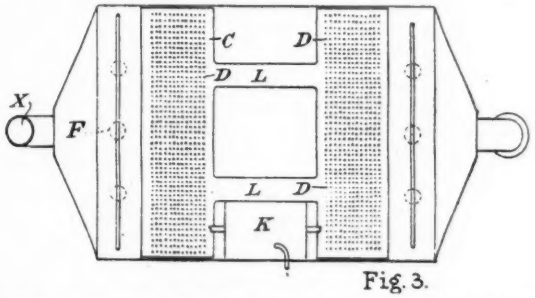

Fig. 3.

called barriers, erected inside the chamber with the object of acting as washers or scrubbers of the mixed gases as they pass through the process.

From the diagram it will be seen that the gases entering the inlet X coming in contact with surfaces B, which are kept moist, set up an accelerated action when meeting a counter flow of liquid fed from reservoirs sunken into the chamber top C. The feed liquor is taken from the bottom chamber acid, and, after cooling, is run into acid elevator H. Although the spray system is used for atomised water or acid this may be dispensed with so long as there is plenty of feed liquor passing through for increased production and concentration.

The barriers are of acid resisting material, and the gases entering X pass horizontally through B, space being allowed in the chamber before passing a final barrier to undergo a similar process prior to reaching the final exit. Fan draught is used in all modern plants in these days to give equilibrium of suction throughout the chambers. The ends of the chambers are truncated or domed in order to facilitate the better distribution of gases which are brought into contact with the bottom chamber acid at the inlet, and leave at the top of the opposite end.

Such a chamber as here described can be erected as a preliminary after the Glover Tower, or may be planned for an entire process. As to working the scheme is automatic and labour saving so long as sufficient acid is left in the process to increase production.

# The Manufacture of Naphthol Yellow S

By J. F. Wynfield Rhodes, B.Sc., A.I.C., M.I.M.E.

THIS is the most popular of the nitro-dyestuffs and is made from α naphthol. The manufacture takes place in two stages. The naphthol is first sulphonated to form α naphthol trisulphonic acid and the product after dilution and cooling is immediately nitrated with fairly strong nitric acid. The product is dinitro α naphthol monosulphonic acid, the sodium salt of which is naphthol yellow S.

The actual sizes of the plant used depends naturally on the output, but it may be pointed out that the sulphonation process is best carried out in large pans as in this way there is less risk of over-heating. Moreover, on the success of this process more than any other depends the yield. Too low a temperature or too weak vitriol means incomplete sulphonation and consequently a low yield. Too high a temperature causes decomposition of the trisulphonic acid to the disulphonic acid and again lowers or more frequently destroys the yield. The nitration process works very well in smaller units and indeed there is some advantage in them as the rather violent reaction that sets in at this stage can thus be better kept in control. The first stage may be carried out, for example, in a small plant in a 50-gallon pan heated preferably by gas, but steam or even a naked fire may be used. The pan may be oil-jacketed, but the author does not favour such pans for sulphonation, as they are excessively sluggish in heating and more difficult to cool if accidentally a little over-heated. Rustless steel has been found an excellent material for the construction of such pans. It is not appreciably attacked under the conditions in which it is used. The pan may be open and fitted with a gate agitator, in which case it must be sufficiently high up to allow of a gravity discharge. The agitation is chiefly necessary during the addition of the naphthol. The latter quickly dissolves in the acid, so in small units hand-stirring with an iron rod is all that is strictly necessary. It is an advantage to sulphonate in a place where there is a good supply of air to carry off the fumes of $SO_2$, which cannot be wholly avoided. A good situation is under a lean-to roof outside the main building.

For the above size of plant a suitable charge is as follows :—

80 lb. crude α naphthol (perfectly dry)
320 lb. vitriol at 168° Tw.

The naphthol is stirred into the vitriol at 100°C., the temperature being then raised to 120°C. and maintained there for 3½ hours. The charge is then, according to the construction of the plant run, syphoned, or blown on to 48 gallons of water.

The nitrating plant may advantageously consist of two 100-gallon stoneware pots provided with stoneware stirring gear and lead-cooling and heating coils. The latter are most essential, the function of the stirrer being chiefly to throw the liquid against the cooling coils. Thermometers must also be provided as temperature control is vital. The pots may advantageously discharge by means of bib-taps into earthenware coolers in which the crystallisation of the free acid of the dyestuff may take place. When the sulphonation has cooled to about 35°C. it is equally divided between the two pots. It is a somewhat viscous fluid at this stage, and if it is to be blown into the nitrators this fact must be taken into account.

The nitric acid can now be run in, taking care that the temperature does not exceed 35°. A good plan is to run in very slowly with the agitator going and the water cut off until the reaction sets in vigorously, when the cooling water has to be started to keep the temperature down. In this way the reaction may be started with as little as one-fifth of the full amount of acid and kept going at a normal rate by the slow addition of nitric. Otherwise at lower temperatures the reaction does not set in till late and then may become so violent as to be unmanageable. In any case no red fumes should be seen at any stage in the process. About 139 lb. of nitric acid 83°Tw. will be required and should be diluted to 70°Tw. before use. When all the nitric acid has been added and the batch matured, *i.e.*, the action settled down, steam is passed through the heating coils and the temperature is raised to at least 40°C. This operation is only partly to ensure complete nitration, its chief purpose is to re-dissolve the naphthol yellow free acid so that on cooling it may crystallise in larger and more easily filtered crystals. A temperature as high as 80° may be employed with a gain in size in the resultant crystals, but this advantage is more than counterbalanced by an increased production of tar. 50° is a recommended temperature. The batch is now run off into a cooler and allowed to crystallise. A low temperature is essential to the best yield and it would certainly pay here to employ artificial refrigeration in hot weather. At other times the temperature usually falls sufficiently during the night to cause the separation of crystals. Generally 36 hours is adequate, but the author has known batches to suspend crystallisation for as much as a week quite unaccountably. Research into the solubility of naphthol yellow free acid in mixed acids would be very profitable.

The crystallised naphthol yellow free acid is now filtered, and the author has found "Filtross" tiles excellent for this purpose. A vacuum filter is suitable as the free acid does not require much filtering space, being very compact as dyestuffs go. If tarry it may be washed with brine, but the latter course should be avoided if possible as the brine crystallises in the tile and is then difficult to get rid of. The waste acid should be tested by nitrometer and need not contain more than 2 per cent. of nitric acid. If it contains more the quantity of nitric acid used in nitration should be reduced as a larger excess is unnecessary. The filter cake is transferred to a small dissolver, mixed with three to four times its weight of water and dissolved by steam, or preferably it may be mixed in the first instance with boiling water. It is then neutralised with soda ash and immediately salted out. When sufficient salt has been added the mass becomes practically solid and can be then vacuum filtered, dried at 80°C., ground and packed.

# Chemical Matters in Parliament

### Wet Carbonising, Ltd.

Mr. BOTTOMLEY asked the Prime Minister (House of Commons, December 22) whether the British Government is a creditor for £200,000 of the Wet Carbonising Co., stated at a recent meeting called for the purpose of winding up to be without assets; and, if so, in what circumstances this obligation was incurred?

Mr. BONAR LAW: Wet Carbonising, Ltd., guaranteed the due fulfilment of a contract by Lochar, Ltd., one of their subsidiary companies, to purchase from the Government the Ironhirst Peat Fuel Factory, near Dumfries, which was established during the War for the supply of peat briquettes to the Army. The agreed price was £370,000, but unfortunately these companies have been unable to raise the additional capital required to enable the purchase to be completed. Arrangements are now being made to dispose of the factory elsewhere, but the Government can claim on Wet Carbonising, Ltd., for any difference between the amount realised and the price referred to above, and to this extent the Government is a creditor of Wet Carbonising, Ltd.

### British Petroleum Company German Shares

Mr. CAPE asked the President of the Board of Trade (House of Commons, December 22) whether the 49,431 £10 shares in the British Petroleum Co., held by the German Europaische Petroleum Union Gesselschaft, were taken over by the Public Trustee in 1916, and subsequently rtansferred to the Anglo-Persian Oil Co.; what sum was paid by the latter company for these shares; whether the proceeds have been handed over to the German company that held the shares; and, if not, what has been done with the money?

Sir P. LLOYD-GREAME: The answer to the first part of this question is in the affirmative. The 49,431 shares, toegther with 200,000 shares in the Homelight Oil Co., Ltd., and 362,582 shares in the Petroleum Steamship Co., Ltd., being allied companies, were vested in the Custodian and sold by him for the sum of £2,650,000. The proceeds have not been handed over to the German company, but are held by the Custodian as subject to the charge for securing *inter alia* the payment of debts due to British nationals in accordance with the terms of the Treaty of Peace with Germany.

The group of companies hitherto known as Explosives Trades, Ltd., has changed its name to Nobel Industries, Ltd.

In a fire at the glue and gelatine works of Cannon & Co., Lincoln, on Tuesday night stocks valued at £30,000 were destroyed.

## The Dyestuffs Bill

### The Last Stage in the Lords

ON Thursday, December 23, in the House of Lords, on the motion of the third reading of the Dyestuffs (Import Regulation) Bill,

The MARQUESS OF SALISBURY moved to provide that a list of the goods prohibited under the Act should be laid on the table of each House for 30 days, and if within this period an Address should be passed by either House praying that any article should be removed from the list, such article should thereupon cease to be prohibited.

VISCOUNT MILNER, Secretary of State of the Colonies, pointed out that in the Bill every possible precaution had been taken that any interference with the trade should only be made, not merely with the knowledge of, but by, the people interested in the trade. That was the very key of the Government's whole policy in this matter. The idea that somebody was going to be suddenly pounced upon for infringing a prohibition of which he was entirely without knowledge was certainly not founded on fact.

LORD BALFOUR said that probably no one had suffered more than he had done for adherence to Free Trade principles, but he preferred the national interest and safety to any abstract principle. It was to the interest of the Government, as well as of the country, that this prohibition should be carried out with as little friction as possible, and, in his opinion, the best way to allay apprehension was to give the fullest information possible.

VISCOUNT PEEL, Under Secretary for War, having stated the objections from an administrative point of view to the proposal of the amendment, expressed the hope that the noble marquess would be content with his assurance that the Board of Trade would issue, at the earliest possible date after the passing of the Act, and after consultation with the interests concerned, as detailed a statement as was practicable of the class of products covered by the prohibition, with, from time to time, such amendment as might be necessary, and of the products covered by the prohibition which might be imported under general licence.

The amendment having been withdrawn, the Bill was read a third time.

On the motion that the Bill do pass, Lord CAWLEY gave notice that next session he would move for a Committee to be set up to inquire into (1) the circumstances under which the Board of Trade allowed a company, which they had been instrumental in forming, which was limited as to dividend, and which had admittedly made great progress towards the formation of a national dye industry, to be amalgamated with Messrs. Levinstein & Company; (2) under which the Board of Trade sold the factory and plant for producing synthetic indigo formerly belonging to Messrs. Meister Lucius & Company at Ellesmere Port to Messrs. Levinstein for £75,000; (3) whether Messrs. Levinstein immediately sold the recipe and process for the manufacture of synthetic indigo to an American firm for £250,000; and (4) the circumstances under which the Government, without the consent of Parliament, have invested £1,700,000 in a public joint-stock company, unlimited in regard to profit.

The Bill was then passed.

### Institute of Industrial Micro-Biology

IN concluding his Cantor lectures on "Micro-organisms and their industrial uses," Mr. A. Chaston Chapman said that anyone who made an unbiassed survey of the work done in various countries in the domain of industrial micro-biology could not honestly feel satisfied with the contribution made by this country. If we were not again to become dependent on other countries for our requirements our manufacturers would have to adopt a very different attitude to scientific and industrial research. He had in a Paper which he recently read before the Society of Chemical Industry, put forward a plea for a national institute of industrial micro-biology. There was not in this country, nor, so far as he was aware, in the British Dominions, any institution devoted to a subject which covered such an immensely wide and varied ground, and which was of such national importance. Since his original plea for the foundation of such an institute, some progress had been made, and he was hopeful that such an institute would before long come into existence.

### Inter-dependence of Science

PROFESSOR BURSTALL, referring to research work and industry in an interview with a representative of the *Birmingham Post*, laid stress upon the interdependence of the several sciences. "In all industries," he says, "the importance of scientific research is now fully recognised. The Universities are anxious to do their share in the discovery of knowledge, but there is a risk of attempting work which cannot be realised completely in an institution devoted to all branches of knowledge. Much technical work having its application to special industries is best carried out by the research associations, which are keenly alive to the particular results they desire, and are able to concentrate on special problems. The universities will carry out their duties if they concentrate on the great fundamental problems which lie at the base of every advance in science. Many of these questions have no immediate commercial application, and there is, therefore, a tendency for them to be put in the background by technical institutions; but on the whole it is advisable that the centres of learning should devote themselves to the extension of the bounds of knowledge quite irrespective of any particular result."

Birmingham proposes to set up a standing Research Committee to co-ordinate research work and deal with the various bodies which are interested in particular problems. It is hoped that in this matter much may be done to develop original research in all its branches. At the present moment a great deal of work is being carried on in the various University laboratories, very largely with the aid of grants from the Department of Industrial and Scientific Research, which has public funds at its disposal. In the department of chemistry there are a number of research students who are working under the able direction of Professor Morgan, mainly on the subject, on which he is an expert, of the chemistry connected with the production of dyes.

One of the most important developments required is the bringing together of research work which spreads itself over different departments of knowledge. "It is becoming increasingly evident," says Professor Burstall, "that many problems can only be solved by co-ordinated effort. Chemistry has frequently to deal with physical problems. Almost all the scientific departments at some stage or other are dependent upon engineering to furnish them with the means of carrying out certain experiments. The life sciences of biology are now finding it an absolute necessity to enter into chemical and physical studies to a far greater extent than formerly. Most researches involve almost all the sciences. For these reasons co-ordination is of the highest importance, and when it comes to the application of science to industry the need of co-ordination is still more strongly marked."

### Brunner, Mond's Australian Project

IN our issue of November 27 we mentioned that Brunner, Mond & Co. anticipated establishing new works in Australia. The enterprise is dependent on the report of experts who have been investigating prospects in that country. A favourable impression is said to have been formed of the salt lakes near Bunbury, in Western Australia, where coalfields, limestone deposits and facilities for transport by water are mentioned as beneficial factors. The recent amalgamation of Brunner, Mond and Co. with Castner Kelaer Alkali was a fusion of two of the greatest chemical companies in England, and Lever Brothers, who are largely interested in the Australian soap-manufacturing industry, lately acquired from Brunner, Mond & Co. the ordinary shares which the latter held in Joseph Crosfield & Sons and William Gossage & Sons. Last year Professor Woolnough, of Western Australia, came to England and submitted to the management of the company results of tests which he had made of deposits in the Lake Preston area, on the coast, about 30 miles north of Bunbury. The directors decided to have further investigations made of alkaligenous formations, not only in this locality, but throughout the Commonwealth, and these are still being carried out by Mr. J. B. Lucas, Professor Woolnough, and Mr. W. Hay. According to *Industrial Australian* if it be found profitable to alkalify any of the Australian deposits there will be a good local demand for the products, which are essential to the soap-making, glass-making, wool-scouring and numerous other industries.

# From Week to Week

Owing to abundance of olives, olive oil may be exported free from Turkey.

A large fertilizer plant is to be established at Welland, Ontario, by a Glasgow fertilizer and chemical firm.

Next Wednesday and Thursday at the Imperial College of Science, South Kensington, the Physical and Optical Societies will hold their Annual Joint Exhibition.

An endowment of £10,000 has been received by the Glasgow Royal Technical College, from the Carnegie Trustees on behalf of a Chair of Inorganic Chemistry.

Mr. W. W. Coblentz, physicist of the American Bureau of Standards, Washington, has been awarded the Janssen Medal by the French Academy of Sciences.

Mr. A. W. Bolden has been elected to the board of the Nitrate Railways Company, Ltd., in place of Colonel F. G. Oldham, resigned.

Prices of fertilizers are too high, according to a statement by the United States Department of Agriculture, and manufacturers in that country who exact an unjust profit will be subject to prosecution.

It is announced in Trinidad that samples of minerals recently forwarded to the United States have been declared to contain unmistakable evidence of the existence of large deposits of bauxite and mica.

Mr. P. J. Channon, assistant to the Leighton Buzzard Gas Co. has been awarded the O.B.E. for special chemical work in connection with the manufacture of mustard gas at H.M. Factory, Avonmouth, during the latter part of the war.

In the hope of freeing Italy from dependence on foreign supplies the government of that country is to resume its inquiry into the possibility of obtaining payable potash from the saline reserves of the Italian islands.

Owing to the inability of the shareholders of the Barnaengens Swedish soap companies to fulfil their contract the anticipated purchase of those companies by Lever Brothers, Ltd., cannot be completed.

According to Mr. H. D. Poore, of the American Department of Agriculture Bureau of Chemistry, oranges, because of the high sugar content of their juice as compared with most other citrus fruits, will produce a vinegar of as good quality as the best grades of apple cider vinegar.

Sir Joseph Verdin, of Garnstone Castle, Herefordshire, died on Tuesday at the age of 82. He was largely interested in the Cheshire salt industry, and at one time was known as the "Salt King." The estate passes to Colonel R. N. H. Verdin, Sir John's nephew, and the title becomes extinct.

A table for the Dominion of Canada showing the quantities of the principal materials used in the manufacture of paper in 1918 includes ground wood pulp, 679,395 tons, sulphite fibre, 242,685 tons, sulphate fibre, 35,587 tons, soda fibre, 4,775 tons, other chemical fibre, 2,419 tons, soda ash, 968 tons, alum 8,382 tons.

In a Bill which the South Metropolitan Gas Co. are promoting power is sought to alter the title of chairman and vice-chairman to those of president and vice-president, and to restrict membership of the directorate to those possessing technical or other qualifications having a direct bearing on the gas industry.

At the end of October the stock of nitrate of soda in Chili amounted to 1,322,000 tons, against 1,668,000 tons on the same date last year, and 671,000 tons two years ago. Production in October amounted to 230,000 tons against 122,000 tons in October last year, and 229,000 tons two years ago. Large stocks are said to be accumulating owing to lack of demand.

Scientists of the United States Bureau of Soils, it is announced, have solved the problem of extracting phosphoric acid from phosphate rock by heating mixtures of this mineral, sand and coke to a melting temperature in a fuel-fed furnace, and claim that the process can be worked out on an approximately commercial basis.

Spontaneous combustion amongst ground rubber in the drying room was the supposed cause of a destructive fire at Russell's (Manchester), Ltd., Land's End Rubber and Chemical Works, Rhodes, Middleton. The bulk of the works was gutted. The extent of the damage has not yet been estimated. Assistance was rendered in subduing the fire by the works fire brigade of O. Ashworth's, dyers, of Rhodes.

Le Blanc method for the production of heavy chemicals, which was brought to this country by the late Mr. Losh in 1796, ceased to be in operation on the Tyneside during 1920. The process has been replaced by the electric process, under which bleaching powder and caustic soda are produced, and by the production of carbonate of soda by the ammonia alkali process.

On Monday, at Leigh, an inquest was held concerning the death of William Boyes and Morris Sabor, which occured on December 22 at the Leigh Brewery. A copper containing 5,000 gallons of boiling wort exploded and the liquor escaped to the room beneath the tank, where the two men were working, scalding them severely. Several other people had narrow escapes. The cause of the explosion is not known. The jury returned a verdict of accidental death.

At the University of Toronto a conference will be held between January 5 and 26 on recent advances in physics. Dr. Irving Langmuir will deliver a short course of lectures on the theories of atomic structure and allied subjects from the chemical point of view as well as from the physical aspect. Professor E. F. Burton is giving a course of twelve lectures on the fundamental properties of colloidal solutions, which it is hoped will be of use to manufacturers as well as scientists.

The President of the Manchester Chamber of Commerce, Chemical and Allied Trades Section, is to convene a general public meeting of all interested in the dye and chemical industries, so that the present position might be considered in all its aspects, including its relation to imports and exports. It is understood that this meeting will be called in the near future and that every endeavour will be made to ensure that it is of a fully representative nature.

One ton of sun-dried wheat straw, says *Power*, produces approximately 10,000 cubic feet of purified gas, 600 lb. to 650 lb. of carbon residue, which may be readily powdered to a very fine consistency, and about 10 gal. of tarry liquid. These results were obtained by Canadian experiments. The gas has a calorific value of about 400 B.Th.U.'s per cubic foot, burns with a blue flame and has a slight odour. The combustible constituents of the gas are carbon monoxide, methane and hydrogen. A ton of straw is equivalent to 32 gal. of petrol.

Westminster City Council propose to cancel their five year contract with Brunner Mond & Co. for soda ash which was to cease on December 31, 1922, and to enter into a new contracts for five years ending December 31, 1925. The present contract is subject to revision of price each year. The new contract is at the following rates :—1921, £7 per ton, carriage extra ; 1922 and 1923, 30s. per ton less than the basis price fixed by the Company for each of those years for one-year contracts, cost of carriage extra ; 10s. per ton reduction to be made on above rates if bags remain the company's property, and are returned in good condition carriage paid. Bags not returned to be charged at 1s. 6d. each. Figures referred to are free on rail at Brunner Mond & Co.'s works. Transit charges to be added.

Representatives of two British oil concerns have entered into negotiations with M. Krassin's delegation for a concession for the exploitation of two oilfields, says the Russian Manufacturers' and Merchants' Association in London. The Association is protesting against the movement, which it considers to be dilapidation of Russian national wealth, and declares that any obligation in the form of concessions or otherwise, by the non recognised Soviet Government, shall have no obligatory force for any future regularly constituted democratic Government of Russia. It is a well-known fact that of all branches of Russian industry the petroleum industry has to the greatest extent attracted British capital and enterprise. About 20 of the 84 companies registered in Great Britain for the exploitation of certain Russian oilfields had started work and invested considerable sums of capital. The property of these companies has been seized by the Bolshevists precisely as has that of purely Russian companies, with the aim of exploiting the industry on Communistic lines. The Association feel sure that in the future a regenerated democratic Russia will require the help of foreign—and particularly of British—capital for the development of the oil industry.

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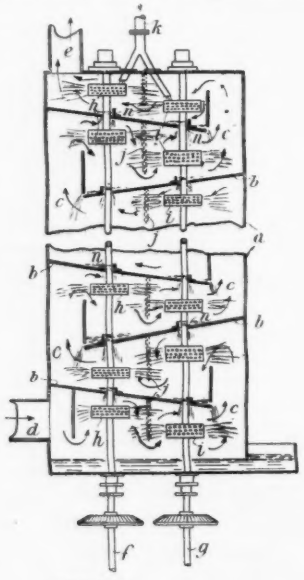
The process is for manufacturing acetic acid from liquid acetaldehyde by subjection to oxygen or a gas containing free oxygen, in presence of a catalyst. Acetaldehyde is mixed with 1 per cent. of kaolin or china clay and 1 per cent. of sodium acetate in a closed vessel provided with a stirring apparatus, and oxygen is passed through while the temperature is maintained at 10°C. to 20°C. The acid may be crystallised out or distilled off. If air is used instead of oxygen, it should be at 6 to 7 atmospheres pressure.

154,309. Gas Washing Apparatus. H. Nielsen, 13, Firs Avenue, Muswell Hill, Middlesex, and F. D. Marshall, 19, Queen Anne's Chambers, Westminster, London. Application date, August 21, 1919.

The apparatus is more particularly applicable to producer gas plant of the by-product recovery type. A tower, *a*, is provided with a series of shelves, *b*, which extend alternately from opposite sides in a downwardly inclined direction, and are of such length that spaces, *c*, are left between the end of each shelf and the tower wall. The gas enters at *d*, passes in



154,309

a zigzag course through the compartments, and is drawn off at the outlet *e*. The washing liquid is introduced through the pipe *k* and is directed on to sprayers *h* and *i*, which are mounted on a pair of vertical rotating shafts, *f*, *g*, so that each shaft has one sprayer in each compartment, as shown. The liquid passes from each shelf *b* through openings *n* on to the sprayers immediately below, and is then sprayed into the next compartment and so on. The gas is further subdivided in each compartment by passing through suspended lengths of chain or metal strips, *j*.

154,328. Sulphate of Ammonia, Manufacture of, and Apparatus therefor. N. Wilton, 100, Station Road, Hendon, London, N.W.4. Application date, August 26, 1919.

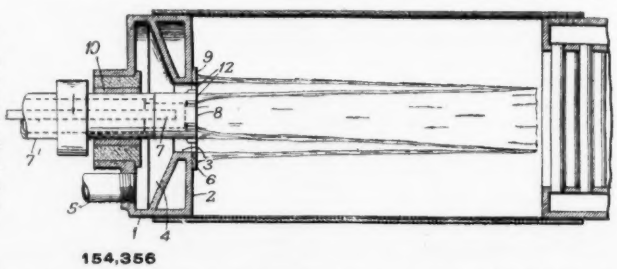
The object is to separate sulphate of ammonia crystals from the mother liquor, and to obtain the sulphate in a purified and dry condition. The wet sulphate is transferred from the saturator to an upright closed vessel mounted on trunnions, and dry steam at a pressure of 70 lb. to 80 lb. per square inch with or without air, is blown into the upper part of the vessel. A perforated horizontal partition is provided near the bottom of the vessel, and the mother liquor is forced into this and thence to a tank, or back to the saturator. The sulphate is thus nearly dried, and contains only about 0·09 per cent. by weight of free acid. To neutralise this acid ammonia from a point in the ammonia still where the strongest ammonia is available—*i.e.*, just above the liming chamber—is then passed through the sulphate crystals with or without steam. The sulphate is then dried by passing through it a further supply of steam or steam and air.

154,334. Cellulose Acetate, Manufacture of Compositions, Preparations or Articles having a Basis of. H. Dreyfus, 8, Waterloo Place, London, S.W.1. Application date, August 26, 1919.

The object is to manufacture solutions, celluloid-like substances, films, dopes, artificial silk or the like from cellulose acetate. These substances are produced by treating the cellulose acetate with solvents or softening agents of high boiling point, with or without volatile solvents, such as acetone, alcohol-benzene, methyl acetate, &c. It is now found that benzene monomethyl sulphonamide, having a boiling point of 180°C. at 1–2 mm. pressure, is a suitable softening agent. The following aromatic dialkyl sulphonamide derivatives are also suitable as softening agents: benzene methylethyl sulphonamide boiling at 170°C.–175°C., mixtures of *o* and *p*-toluene dimethyl sulphonamides boiling at 133°C.–137°C., mixtures of *o* and *p*-toluene methylethyl sulphonamides boiling at 188°C.–189°C., mixtures of *o* and *p*-toluene diethyl sulphonomides boiling at 136°C.–142°C., *o*-toluene dimethyl sulphonamide boiling at 148°C.–152°C., *o*-toluene diethyl sulphonamide boiling at 152°C.–155°C., mixtures of isomeric xylene dimethyl sulphonamides boiling at 150°C.–to 155°C., mixtures of isomeric xylene diethyl sulphonamides boiling at 148°C.–154°C., or mixtures of isomeric xylene methylethyl sulphonamides boiling at 155°C.–156°C. All these boiling points are at about 1 mm. pressure, and the substances are liquid at ordinary temperature, and form jellies at −10°C. to 25°C. These softening agents may be mixed with triphenyl phosphate, tricresyl phosphate or similar substances, with or without aliphatic urea derivatives, which are liquid or have a low melting point. Compare also patents Nos. 132,283 and 133,353. See The Chemical Age, Vol. I., pages 503 and 602.

154,356. Nitrogen, Method and Apparatus for the Fixation of Atmospheric. J. S. Island, Terminal Building, Hamilton, Ont., Canada. Application date, September 3, 1919.

The apparatus is for effecting the combination of atmospheric nitrogen and oxygen by means of an electric arc struck across an annular space. A cylindrical electrode, 1, is constructed with a flat outer face, 2, and a central circular opening,



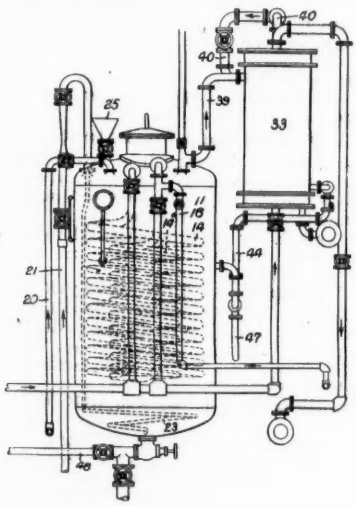
154,356

3, leading from an annular chamber, 4. An electrode ring, 6, is secured to the face 2 surrounding the opening 3, and the electrode 1 is water cooled. The inner electrode 7 is arranged with its flat outer face 8 in the same plane as the face 9, and is carried by a hollow shaft, $7^1$, which rotates in a bearing, 10, insulated from the outer electrode. The inner electrode 7 may be provided with radial projections, 12, to facilitate the starting of the arc and ensure the maintainance of an annular electric

flame. Air is introduced through the pipe and passes out through the opening 3 at such a rate that it elongates the flame into a double-walled tubular shape as shown. In one example the flame is elongated to about 18 inches when using 52 kilowatts at 1,600 volts. The elongation of the flame effects a gradual cooling of the gas and prevents a reversible reaction.

154,368. ACETIC ACID, APPARATUS FOR THE MANUFACTURE OF. H. W. Matheson, Shawinigan Falls, Quebec, Canada. Application date, September 9, 1919.

The apparatus is for the manufacture of acetic acid from acetaldehyde by the process described in patent No. 132,558 (see THE CHEMICAL AGE, Vol I., page 528). An aluminium vessel, 11, is charged with aldehyde through the pipe 20, and a suitable amount of catalyst, such as manganese acetate, is introduced through the funnel 25. Steam is supplied through the pipe 18 to the inner heating coil 14 to raise the temperature of the aldehyde sufficiently to start the reaction. The steam is then turned off and air is supplied through the pipe 21 to the coil 23, which is perforated on its lower side, so that the air




154,368

stirs up the catalyst and keeps it in suspension. The temperature of the mixture is kept down to the desired point by passing water through either or both of the coils 14, $14^a$. Part of the aldehyde and acetic acid are vaporised and passed through a pipe, 39, to a water condenser, 33, and any vapour which does not condense passes on through a pipe, 40, to a colder brine condenser or to a scrubber. The condensate from the condensers is returned through pipes 44, 47 to the reaction vessel, and the circulation continues as long as a suitable temperature is maintained in that vessel. When the solution reaches the required concentration the air supply is cut off, and the acid is drawn off through pipe 48.

154,464. HYDROCARBON OIL, TREATMENT OF. N. V. S. Knibbs, 810-811, Salisbury House, London, E.C.2. Application date, December 20, 1919.

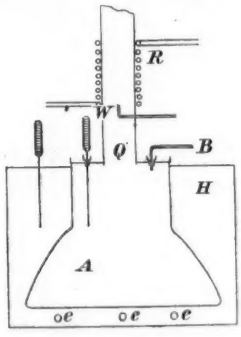
It is found that the cracking of hydrocarbon oils is promoted by heating the oil in the presence of a metal in the alkali group, preferably sodium or a sodium-lead alloy. The operation may be carried out in a still provided with a fractionating column or in an autoclave, and in the latter case the product may subsequently be distilled in contact with the metal or after it has been separated from it. In another alternative the oil may be vaporised and then passed through the molten metal.

154,471. NICKEL SALT, METHOD FOR ELECTROLYSING A SOLUTION OF. C. Heberlein, 15, Western Gardens, Ealing, London. Application date, August 8, 1919.

The process is for producing nickel electrolytically by a cyclic method, using insoluble anodes, and with an economical current density. Nickel is dissolved from its ore by means of acid until a solution is obtained having the optimum acidity for electrolysis. This solution is circulated through the cathode compartment of a number of electrolytic cells in series, and a nickel salt solution is also circulated through the anolyte compartments of the cells in series. The acidity of the catholyte diminishes during electrolysis, and that of the anode increases, while a diffusion of the anolyte takes place through the porous diaphragms, and restores the acidity of the catholyte within the optimum limits. The circulation is continued until the acidity of the anolyte is too high for this purpose and it is then partly or wholly withdrawn, and used for preparing fresh nickel salt from the ore or matte. The catholyte is mixed with fresh nickel salt and returned to the circuit. Each cell may contain a number of cathode compartments, each containing a cathode, while insoluble anodes are placed between the compartments; the whole is immersed in a single anode compartment.

154,472. HYDROBROMIC ACID, PROCESS FOR THE MANUFACTURE OF—FROM BROMINE AND HYDROGEN. H. R. Napp, 7 & 8, Idol Lane, London, E.C. 3. (From A. Tschudi, 192, Richenstreet, Riehen, Basle, Switzerland.) Application date, January 6, 1920.

Bromine is passed through the tube *B* into a quartz vessel *A* heated to 140°C.-150°C. by means of the oven *H* heated




154,472

by electric heating elements *ε*. The bromine gas is superheated and passes into the quartz tube *Q* where it meets a stream of hydrogen at *W*. The tube is heated to the reaction temperature by the coil *R* to effect ignition, and the temperature is then maintained by the reaction. The proportions of hydrogen and bromine are adjusted by watching the flame through a sight glass, and the hydrobromic acid gas passes on to an absorption apparatus.

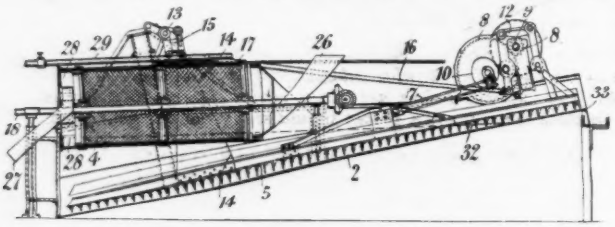
154,498. POTASSIUM CARBONATE AND SODIUM CARBONATE, PROCESS FOR THE MANUFACTURE OF. S. Lamm, 172, Rue des Palais, Brussels, Belgium. Application date, March 2, 1920.

Commercially pure potassium carbonate is produced by mixing potassium sulphate, barium sulphide and potassium bicarbonate together in boiling water. Nascent potassium sulphide is produced and reacts with the bicarbonate to produce potassium carbonate. The barium sulphate produced is used for regenerating the sulphide. The potassium carbonate produced is of a high degree of purity.

154,512. WASHING AND CLASSIFYING ORES AND OTHER MATERIALS, APPARATUS FOR. R. Haddan, London. (From the Dorr Co., 1009, 17th Street, Denver, Colo., U.S.A.). Application date, May 17, 1920.

A trough, 2, inclined to the horizontal has an overflow, 4, at the side at the lower end, and an outlet, 33, at the upper end. A conveyor, 5, is reciprocated over the floor by means of a driving shaft, 9, through gearing 8 and connecting rods 7, while cams 10 acting on oscillating levers 12 lift the conveyor above the surface of the settling material at the end of each stroke. A cylindrical trommel 17 of perforated material is mounted on a rotating shaft, 18, which is slightly inclined. The suspension mechanism includes a rocker shaft, 13, hangers 14, on the conveyor, and bell cranks, 15, connected by rods, 16, to the oscillating levers, 12. The material is fed into the trough, 26, from which it passes into the trommel, 17, while

water is supplied through the perforated pipe, 29, and the coarser portion of the material is discharged by buckets, 28, into a launder 27. Water is maintained in the trough at the level 32 and the finer portion which settles to the bottom of the trough is moved by the conveyor to the overflow 33.



154,512

The lighter material which remains in suspension in the water is discharged at the overflow 14. The apparatus is particularly suitable for the treatment of sandy iron ores, in which the fine material is of a very low grade.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention :—130,334 (F. M. Wiberg) relating to reduction of ores and oxygen compounds, *see* Vol. I., page 454 ; 139,173 (L. H. Diehl) relating to recovery of sulphur from blast furnace slag, *see* Vol. II., page 479.

### International Specifications Not Yet Accepted

152,289. LEAD AND SILVER ORES, TREATING. H. J. E. Hamilton, William Street, North Broken Hill, New South Wales. International Convention date, October 8, 1919.

The ore is roasted in contact with air with an alkali chloride to about 400°C. to chloridise the lead and silver, or at a higher temperature to chloridise all the metals. The lead and some of the silver are dissolved out from the product by leaching with hot alkali chloride, and the remainder of the silver may then be extracted with sodium thiosulphate solution. The solution first obtained is treated with metallic zinc or aluminium, when lead and silver are deposited ; these are compressed under water and then melted. The second leaching solution is mixed with sodium chloride and also treated with zinc or aluminium to obtain lead richer in silver. The solid residue is treated by a froth separation process to obtain the zinc. Alternatively the leaching solutions may be electrolysed to obtain the lead and silver.

152,356. PURIFYING WASTE LIQUIDS. Koppers Co., Union Arcade Building, Fifth Avenue, Pittsburg, Pa., U.S.A. (Assignees of E. A. Dieterle and S. D. Semenow, Union Arcade Building, Fifth Avenue, Pittsburg, Pa., U.S.A.). International Convention date, February 15, 1919.

Waste liquor from ammonia stills, which contains phenoloid bodies, is aerated, the solids separated by settling, and then filtered through an inorganic substance such as slag containing iron oxide. The liquor is then treated with ferrous sulphate and copper sulphate to remove cyanogen compounds and then filtered through peat. The liquor is finally filtered through a bed of earth.

LATEST NOTIFICATIONS.

155,560. Rotary pumps. Joos et Cie vorm. Geb. Joos. December 11, 1919.

155,572. Process and apparatus for the production of zinc dust. Gieffert, R. December 12, 1919.

155,575-6. Manufacture of derivatives of *p*-aminophenol and of its *o*-alkyl-ethers. Kolshorn, E. December 12, 1919.

155,577. Manufacture of derivatives of 3 : 3′-diamino-4 : 4′- dioxyarsenobene. Farbwerke vorm Meister, Lucius and Bruning. December 12, 1919.

155,259. Process for the manufacture of sulphur preparations of the thiophene series from tar oils of bituminous rock rich in sulphur. Scheibler, H. April 28, 1914.

155,290. Treatment of the froth of fermenting or boiling liquids, and apparatus therefor. Verein Der Spiritus-Fabrikanten. August 19, 1916.

155,302. Processes and apparatus for the direct synthesis of ammonia. L'Air Liquide Soc. Anon. Pour L'Etude et L'Exploitation Des Procedes. G. Claude. December 15, 1919.

155,546. Process for the manufacture of sulphur preparations of the thiophene series from tar oils of bituminous rock rich in oil. Scheibler, H. November 24, 1915.

155,592. Process of synthesizing ammonia. Nitrogen Corporation. December 20, 1919.

### Specifications Accepted, with Date of Application

132,510. Iron-free ammonium alum from aluminium sulphate solutions containing ferric sulphate. Process for the production of. R. Gans. September 21, 1917.

135,187. Chromium or alloys of chromium, Production of. Aktiebolaget Ferrolegeringar. November 15, 1918.

138,915. Rubber, Treatment of. Hunter Dry Kiln Co. September 25, 1915.

147,543. Ethylene from gaseous mixtures containing it, Process for the extraction of. W. Traube. July 14, 1919.

154,985. Electric welding apparatus. British Thomson-Houston Co. (*General Electric Co.*). September 3, 1919.

155,012. Peat, brown-coal, or the like, Method of treating—and apparatus therefor. T. A. Goskar and G. E. Thomas. September 8, 1919.

155,020. Oils and fats, Method of refining—whereby they are deodorized and their acidity reduced. K. H. Vakil. September 9, 1919.

155,118. Electrolytic cells. I. H. Levin. December 31, 1919.

155,164. Tunnel-kilns or furnaces. R. C. Metcalfe. April 7, 1920.

155,167. Charging of inclined or vertical gas-making retorts, producers, or the like. R. & J. Dempster and G. F. H. Beard. April 15, 1920.

### Applications for Patents

Böhme Akt.-Ges., H. T. Production of fat-dissolving substances. 35,723. December 20. (Germany, December 19, 1919.)

British Dyestuffs Corporation. Manufacture of 1 chlor-2-amino-anthraquinone. 35,853. December 21.

Brutzkus, M. Process for effecting chemical reactions in interior of compressors. 35,975. December 22. (United States, December 22, 1919.)

Drey, N. and Williams & Co., J. E. Catalysts and catalytic reactions. 36,189. 36,190. 36,191. December 24.

Fabriques de Produits Chimiques de Thann et de Mulhouse. Manufacture of borneol. 36,260. December 24. (France, May 28.)

Fyfe, A. W. Manufacture of 1-chlor-2-amino-anthraquinone. 35,853. December 21.

Hughes, A. J. Distillation of oil, &c., from shale, &c. 35,874. December 22.

Inrig, G. Electro-chemical treatment of petrol cans for removal and prevention of corrosion. 35,976. December 22.

Köln-Rottweil Akt.-Ges. Manufacture of cellulose material. 36,001. December 22. (Germany, December 30, 1919.)

Pearse, W. F. Hydromain valves for coke ovens, &c. 36,151. December 24.

Richardson Corporation. Apparatus for carbonating beverages, &c. 35,999. December 22.

Rigby, H. A. Evaporation of liquids containing solids in solution or suspension. 36,183. December 24.

Rollason, A. Production of ammonia. 35,876. December 22.

Starrels, J. Process for producing fatty acids of high melting point. 36,081. December 23. (United States, March 1, 1916.)

Stockholms Superfosfat Fabriks Aktiebolag. Method of manufacturing acetaldehyde from acetylene. 35,970. December 22. (Sweden, December 16, 1919.)

### The Faraday Society

AT the annual general meeting of the Faraday Society the following officers and council were elected to serve for the coming year : President, Professor Alfred W. Porter, F.R.S. Past-Presidents, James Swinburne, F.R.S., Sir Richard Glazebrook, K.C.B., F.R.S., Sir Robert Hadfield, Bart., F.R.S. ; Vice-Presidents, W. R. Cooper, Professor C. H. Desch, Dr. J. A. Harker, O.B.E., F.R.S., Emil Hatschek, Professor T. M. Lowry, C.B.E., F.R.S., Dr. E. H. Rayner, Dr. G. Senter ; Treasurer, Robert L. Mond, F.R.S.E. ; Council, Dr. A. J. Allmand, Dr. H. Borns, Professor W. C. McC. Lewis, Harold Moore, O.B.E., Professor J. R. Partington, C. C. Paterson, O.B.E., Professor A. O. Rankine, Sir Robert Robertson, F.R.S., Sir T. Kirke Rose, Dr. W. Rosenhain, F.R.S.

In proposing a vote of thanks to the retiring President, Sir Robert Hadfield, who had guided the Society during the whole critical period of the war, Professor Porter referred to the growth that had taken place in the Society's work and in the prestige during that period. He remarked that of the 26 general discussions that had been organised by the Society, many of them in co-operation with other Societies whose collaboration was greatly appreciated, no fewer than 19 had been held during Sir Robert Hadfield's presidency.

# Market Report and Current Prices

*Our Market Report and Current Prices are exclusive to* THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

## Market Report

THURSDAY, December 30.

On account of the extended Christmas holidays, the market has been practically at a standstill since our last report, to which we have little to add. We look for a substantial improvement in trade conditions in the early part of the New Year.

The Export situation remains uninteresting.

### General Chemicals

ACETONE is in steady demand, price unchanged.

ACID ACETIC has been more enquired for and a better business has been done for January. The tendency is slightly firmer.

ACID CARBOLIC remains a lifeless market and quotations are nominal.

ACID FORMIC is in slow demand; the price has become steadier.

ACID OXALIC is not much enquired for and is inclined to be a little easier.

ACID TARTARIC.—The position is unchanged.

BLEACHING POWDER.—The situation is still influenced by cheap Continental offers.

COPPER SULPHATE remains a weak market, and it is difficult to forecast any early improvement.

FORMALDEHYDE has become scarcer for spot delivery, but with an uncertain demand there is not much movement in price.

LEAD SALTS are unchanged and in very poor demand.

MAGNESIUM SALTS continue to favour buyers and little business is reported.

POTASSIUM CARBONATE.—The reduction in price does not seem to encourage business. The turnover is nominal.

POTASSIUM CAUSTIC.—The same remarks apply as in the case of Potassium Carbonate.

POTASSIUM PRUSSIATE.—The price to-day appears to be reasonable, and manufacturers hold out little hope of any further reduction.

SODIUM ACETATE is not much enquired for, price unchanged.

SODIUM CAUSTIC is still freely offered by secondhands, but it is difficult to find a market.

SODIUM BICHROMATE is a second-hand market, but the general tone has improved.

SODIUM HYPOSULPHITE.—The fall in price seems to have been arrested, but there are a few buyers.

SODIUM NITRITE is a weak market, and lower prices are not unlikely.

SODIUM PRUSSIATE.—There have been some cheap offers in secondhands, and the present level of prices appears to be unattractive to makers.

ZINC SALTS are only a nominal market.

### Coal Tar Intermediates

There is practically nothing to report in this market.

ANILINE OIL AND SALT.—We understand that makers have now fixed their prices for the Home Trade for next year at 1s. 6½d. for Oil and 1s. 7½d. for Salt.

BETA NAPHTHOL remains on the quiet side, without change in price.

PARANITRANILINE is in small enquiry and prices are extremely firm.

SALICYLIC ACID is only in moderate demand.

### Coal Tar Products

The prices for this week assume a more or less nominal aspect, owing to many works being closed for the holidays.

90's BENZOL is in fair demand and is worth about 3s. 6d. on rails in the North and 3s. 4d. to 3s. 6d. in London.

PURE BENZOL is quoted at 3s. 9d. to 3s. 10d. on rails.

CREOSOTE OIL remains steady at 1s. 1½d. per gallon in the North and 1s. 2½d. to 1s. 3d. in the South.

CRESYLIC ACID is weak, and is quoted 3s. 9d. to 3s. 11d. for 95/97 per cent. and 4s. to 4s. 3d. for the Pale 97/99 per cent. quality.

SOLVENT NAPHTHA is quoted at 2s. 9d. to 3s. per gallon on rails at the works.

HEAVY NAPHTHA is worth 3s. 2d. to 3s. 3d.

NAPHTHALENE is weak, Crude qualities being worth from £12 to £20, with Refined at £34 to £38 per ton.

PITCH.—There is no change in the position.

### Sulphate of Ammonia

There are no new features to report.

## Current Prices

### Chemicals

| | per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| Acetic anhydride | lb. | 0 | 2 | 6 | to | 0 | 3 | 0 |
| Acetone oil | ton | 90 | 0 | 0 | to | 95 | 0 | 0 |
| Acetone, pure | ton | 115 | 0 | 0 | to | 120 | 0 | 0 |
| Acid, Acetic, glacial, 99-100% | ton | 77 | 10 | 0 | to | 80 | 0 | 0 |
| Acetic, 80% pure | ton | 65 | 10 | 0 | to | 66 | 0 | 0 |
| Arsenic | ton | 100 | 0 | 0 | to | 105 | 0 | 0 |
| Boric, cryst. | ton | 74 | 10 | 0 | to | 76 | 0 | 0 |
| Carbolic, cryst. 39-40% | lb. | 0 | 0 | 10½ | to | 0 | 0 | 11 |
| Citric | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Formic, 80% | ton | 90 | 0 | 0 | to | 95 | 0 | 0 |
| Gallic, pure | lb. | 0 | 6 | 3 | to | 0 | 6 | 6 |
| Hydrofluoric | lb. | 0 | 0 | 8½ | to | 0 | 0 | 9 |
| Lactic, 50 vol. | ton | 37 | 10 | 0 | to | 40 | 0 | 0 |
| Lactic, 60 vol. | ton | 47 | 10 | 0 | to | 50 | 0 | 0 |
| Nitric, 80 Tw. | ton | 41 | 0 | 0 | to | 44 | 0 | 0 |
| Oxalic | lb. | 0 | 1 | 4 | to | 0 | 1 | 5 |
| Phosphoric, 1.5 | ton | 65 | 0 | 0 | to | 67 | 0 | 0 |
| Pyrogallic, cryst | lb. | 0 | 11 | 6 | to | 0 | 11 | 9 |
| Salicylic, Technical | lb. | 0 | 1 | 8 | to | 0 | 1 | 10 |
| Salicylic, B.P. | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| Sulphuric, 92-93% | ton | 8 | 10 | 0 | to | 8 | 15 | 0 |
| Tannic, commercial | lb. | 0 | 3 | 6 | to | 0 | 3 | 9 |
| Tartaric | lb. | 0 | 2 | 2 | to | 0 | 2 | 4 |
| Alum, lump | ton | 19 | 10 | 0 | to | 20 | 0 | 0 |
| Alum, chrome | ton | 60 | 0 | 0 | to | 65 | 0 | 0 |
| Alumino ferric | ton | 9 | 0 | 0 | to | 9 | 10 | 0 |
| Aluminium, sulphate, 14-15% | ton | 17 | 10 | 0 | to | 18 | 10 | 0 |
| Aluminium, sulphate, 17-18% | ton | 20 | 10 | 0 | to | 21 | 10 | 0 |
| Ammonia, anhydrous | lb. | 0 | 2 | 2 | to | 0 | 2 | 4 |
| Ammonia, .880 | ton | 43 | 0 | 0 | to | 45 | 0 | 0 |
| Ammonia, .920 | ton | 30 | 0 | 0 | to | 32 | 10 | 0 |
| Ammonia, carbonate | lb. | 0 | 0 | 7½ | to | | — | |
| Ammonia, chloride | ton | 95 | 0 | 0 | to | 100 | 0 | 0 |
| Ammonia, muriate (galvanisers) | ton | 60 | 0 | 0 | to | 65 | 0 | 0 |
| Ammonia, nitrate | ton | 55 | 0 | 0 | to | 60 | 0 | 0 |
| Ammonia, phosphate | ton | 110 | 0 | 0 | to | 115 | 0 | 0 |
| Ammonia, sulphocyanide | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Amyl acetate | ton | 420 | 0 | 0 | to | 425 | 0 | 0 |
| Arsenic, white, powdered | ton | 80 | 0 | 0 | to | 82 | 0 | 0 |
| Barium, carbonate, 92-94% | ton | 12 | 10 | 0 | to | 13 | 0 | 0 |
| Barium, chlorate | lb. | 0 | 0 | 11 | to | 0 | 1 | 0 |
| Chloride | ton | 23 | 0 | 0 | to | 24 | 0 | 0 |
| Nitrate | ton | 55 | 0 | 0 | to | 56 | 0 | 0 |
| Barium Sulphate, blanc fixe, dry | ton | 30 | 0 | 0 | to | 31 | 0 | 0 |
| Sulphate, blanc fixe, pulp | ton | 16 | 10 | 0 | to | 17 | 0 | 0 |
| Sulphocyanide, 95% | lb. | 0 | 1 | 6 | to | 0 | 1 | 8 |
| Bleaching powder, 35-37% | ton | 30 | 0 | 0 | to | 31 | 0 | 0 |
| Borax crystals | ton | 41 | 0 | 0 | to | 42 | 10 | 0 |
| Calcium acetate, Brown | ton | 19 | 0 | 0 | to | 20 | 0 | 0 |
| ,, Grey | ton | 29 | 0 | 0 | to | 30 | 0 | 0 |
| Calcium Carbide | ton | 29 | 0 | 0 | to | 30 | 0 | 0 |
| Chloride | ton | 12 | 10 | 0 | to | 13 | 0 | 0 |

| | per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| Carbon bisulphide | ton | 65 | 0 | 0 | to | 67 | 0 | 0 |
| Casein, technical | ton | 90 | 0 | 0 | to | 92 | 0 | 0 |
| Cerium oxalate | lb. | 0 | 3 | 9 | to | 0 | 4 | 0 |
| Chromium acetate | lb. | 0 | 1 | 2 | to | 0 | 1 | 4 |
| Cobalt acetate | lb. | 0 | 11 | 6 | to | 0 | 12 | 6 |
| Oxide, black | lb. | 1 | 0 | 0 | to | 1 | 0 | 6 |
| Copper chloride | lb. | 0 | 1 | 3 | to | 0 | 1 | 6 |
| Sulphate | ton | 41 | 0 | 0 | to | 42 | 0 | 0 |
| Cream Tartar, 98-100% | ton | 220 | 0 | 0 | to | 225 | 0 | 0 |
| Epsom salts (*see* Magnesium sulphate) | | | | | | | | |
| Formaldehyde 40% vol | ton | 130 | 0 | 0 | to | 135 | 0 | 0 |
| Formusol (Rongalite) | lb. | 0 | 4 | 9 | to | 0 | 5 | 1 |
| Glauber salts | ton | Nominal. | | | | | | |
| Glycerine, crude | ton | 70 | 0 | 0 | to | 72 | 10 | 0 |
| Hydrogen peroxide, 12 vols. | gal. | 0 | 2 | 8 | to | 0 | 2 | 9 |
| Iron perchloride | ton | 50 | 0 | 0 | to | 52 | 0 | 0 |
| Iron sulphate (Copperas) | ton | 4 | 0 | 0 | to | 4 | 5 | 0 |
| Lead acetate, white | ton | 67 | 10 | 0 | to | 70 | 0 | 0 |
| Carbonate (White Lead) | ton | 61 | 0 | 0 | to | 63 | 0 | 0 |
| Nitrate | ton | 62 | 10 | 0 | to | 65 | 0 | 0 |
| Litharge | ton | 57 | 0 | 0 | to | 59 | 0 | 0 |
| Lithopone, 30% | ton | 40 | 0 | 0 | to | 41 | 0 | 0 |
| Magnesium chloride | ton | 15 | 10 | 0 | to | 16 | 10 | 0 |
| Carbonate, light | cwt | 2 | 15 | 0 | to | 3 | 0 | 0 |
| Sulphate (Epsom salts commercial) | ton | 12 | 10 | 0 | to | 13 | 0 | 0 |
| Sulphate (Druggists') | ton | 18 | 10 | 0 | to | 19 | 10 | 0 |
| Manganese, Borate | ton | 190 | 0 | 0 | to | | — | |
| Sulphate | ton | 130 | 0 | 0 | to | 135 | 0 | 0 |
| Methyl acetone | ton | 95 | 0 | 0 | to | 100 | 0 | 0 |
| Alcohol, 1% acetone | gall. | Nominal. | | | | | | |
| Nickel sulphate, single salt | ton | 60 | 0 | 0 | to | 62 | 0 | 0 |
| Nickel ammonium sulphate, double salt | ton | 62 | 0 | 0 | to | 64 | 0 | 0 |
| Potassium bichromate | lb. | 0 | 1 | 3 | to | 0 | 1 | 4 |
| Carbonate, 90% | ton | 90 | 0 | 0 | to | 95 | 0 | 0 |
| Chloride | ton | 50 | 0 | 0 | to | 52 | 0 | 0 |
| Chlorate | lb. | 0 | 0 | 8½ | to | 0 | 0 | 9 |
| Meta bisulphite, 50-52% | ton | 215 | 0 | 0 | to | 225 | 0 | 0 |
| Nitrate, refined | ton | 65 | 0 | 0 | to | 67 | 0 | 0 |
| Permanganate | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Prussiate, red | lb. | 0 | 3 | 3 | to | 0 | 3 | 6 |
| Prussiate, yellow | lb. | 0 | 1 | 8 | to | 0 | 1 | 10 |
| Sulphate, 90% | ton | 31 | 0 | 0 | to | 33 | 0 | 0 |
| Salammoniac, firsts | cwt. | 5 | 10 | 0 | to | | — | |
| Seconds | cwt. | 5 | 5 | 0 | to | | — | |
| Sodium acetate | ton | 48 | 0 | 0 | to | 50 | 0 | 0 |
| Arsenate, 45% | ton | 60 | 0 | 0 | to | 62 | 0 | 0 |
| Bicarbonate | ton | 10 | 10 | 0 | to | 11 | 0 | 0 |
| Bichromate | lb. | 0 | 0 | 9½ | to | 0 | 0 | 10 |
| Bisulphite, 60-62% | ton | 37 | 10 | 0 | to | 40 | 0 | 0 |
| Chlorate | lb. | 0 | 0 | 5½ | to | 0 | 0 | 5½ |
| Caustic, 70% | ton | 30 | 0 | 0 | to | 31 | 0 | 0 |
| Caustic, 76% | ton | 31 | 0 | 0 | to | 32 | 0 | 0 |
| Hydrosulphite, powder, 85% | lb. | 0 | 2 | 3 | to | 0 | 2 | 6 |
| Hyposulphite, commercial | ton | 27 | 10 | 0 | to | 30 | 0 | 0 |
| Nitrite, 96-98% | ton | 69 | 0 | 0 | to | 70 | 0 | 0 |
| Phosphate, crystal | ton | 37 | 0 | 0 | to | 39 | 0 | 0 |
| Perborate | lb. | 0 | 2 | 2 | to | 0 | 2 | 4 |
| Prussiate | lb. | 0 | 1 | 1 | to | 0 | 1 | 1½ |
| Sulphide, crystals | ton | 25 | 0 | 0 | to | 27 | 10 | 0 |
| Sulphide, solid, 60-62% | ton | 45 | 0 | 0 | to | 47 | 0 | 0 |
| Sulphite, cryst | ton | 17 | 10 | 0 | to | 18 | 10 | 0 |
| Strontium carbonate | ton | 85 | 0 | 0 | to | 90 | 0 | 0 |
| Strontium Nitrate | ton | 90 | 0 | 0 | to | 95 | 0 | 0 |
| Sulphate, white | ton | 8 | 10 | 0 | to | 10 | 0 | 0 |
| Sulphur chloride | ton | 42 | 0 | 0 | to | 44 | 10 | 0 |
| Sulphur, Flowers | ton | 19 | 0 | 0 | to | 19 | 10 | 0 |
| Roll | ton | 19 | 0 | 0 | to | 19 | 10 | 0 |
| Tartar emetic | lb. | 0 | 2 | 10 | to | 0 | 3 | 0 |
| Tin perchloride, 33% | lb. | 0 | 2 | 6 | to | 0 | 2 | 7 |
| Perchloride, solid | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Protochloride (tin crystals) | lb | 0 | 2 | 0 | to | 0 | 2 | 1 |
| Zinc chloride, 102 Tw. | ton | 22 | 0 | 0 | to | 23 | 10 | 0 |
| Chloride, solid, 96-98% | ton | 60 | 0 | 0 | to | 65 | 0 | 0 |
| Oxide, 99% | ton | 56 | 0 | 0 | to | 57 | 0 | 0 |
| Dust, 90% | ton | 90 | 0 | 0 | to | 92 | 10 | 0 |
| Sulphate | ton | 21 | | | | 23 | 10 | 0 |

## Coal Tar Intermediates, &c.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Alphanaphthol, crude | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| Alphanaphthol, refined | lb. | 0 | 4 | 6 | to | 0 | 4 | 9 |
| Alphanaphthylamine | lb. | 0 | 3 | 3 | to | 0 | 3 | 6 |
| Aniline oil, drums extra | lb. | 0 | 1 | 8 | to | 0 | 1 | 9 |
| Aniline salts | lb. | 0 | 1 | 10 | to | 0 | 2 | 0 |
| Anthracene, 85-90% | lb. | | — | | to | | — | |
| Benzaldehyde (free of chlorine) | lb. | 0 | 5 | 9 | to | 0 | 6 | 0 |
| Benzidine, base | lb. | 0 | 11 | 6 | to | 0 | 12 | 0 |
| Benzidine, sulphate | lb. | 0 | 10 | 0 | to | 0 | 10 | 6 |
| Benzoic acid | lb. | 0 | 2 | 9 | to | 0 | 3 | 0 |
| Benzoate of soda | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Benzyl chloride, technical | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| Betanaphthol benzoate | lb. | 0 | 10 | 0 | to | 0 | 11 | 0 |
| Betanaphthol | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Betanaphthylamine, technical | lb | 0 | 11 | 6 | to | 0 | 12 | 6 |
| Croceine Acid, 100% basis | lb | 0 | 5 | 0 | to | 0 | 6 | 3 |
| Dichlorbenzol | lb | 0 | 0 | 9 | to | 0 | 0 | 10 |
| Diethylaniline | lb. | 0 | 6 | 9 | to | 0 | 7 | 6 |
| Dinitrobenzol | lb. | 0 | 1 | 5 | to | 0 | 1 | 6 |
| Dinitrochlorbenzol | lb. | 0 | 1 | 5 | to | 0 | 1 | 6 |
| Dinitronaphthaline | lb. | 0 | 1 | 6 | to | 0 | 1 | 8 |
| Dinitrotoluol | lb. | 0 | 1 | 8 | to | 0 | 1 | 9 |
| Dinitrophenol | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Dimethylaniline | lb. | 0 | 5 | 9 | to | 0 | 6 | 0 |
| Diphenylamine | lb. | 0 | 5 | 0 | to | 0 | 5 | 3 |
| H-Acid | lb. | 0 | 14 | 0 | to | 0 | 14 | 6 |
| Metaphenylenediamine | lb. | 0 | 5 | 9 | to | 0 | 6 | 0 |
| Monochlorbenzol | lb. | 0 | 0 | 10 | to | 0 | 1 | 0 |
| Metanilic Acid | lb. | 0 | 7 | 6 | to | 0 | 8 | 6 |
| Monosulphonic Acid (2:7) | lb. | 0 | 7 | 6 | to | 0 | 8 | 0 |
| Naphthionic acid, crude | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| Naphthionate of Soda | lb. | 0 | 4 | 3 | to | 0 | 4 | 6 |
| Naphthylamin-di-sulphonic-acid | lb. | 0 | 5 | 0 | to | 0 | 5 | 6 |
| Nitronaphthaline | lb. | 0 | 1 | 6 | to | 0 | 1 | 8 |
| Nitrotoluol | lb. | 0 | 1 | 4 | to | 0 | 1 | 5 |
| Orthoamidophenol, base | lb. | 0 | 18 | 0 | to | 1 | 0 | 0 |
| Orthodichlorbenzol | lb. | 0 | 1 | 1 | to | 0 | 1 | 2 |
| Orthotoluidine | lb. | 0 | 2 | 3 | to | 0 | 2 | 6 |
| Orthonitrotoluol | lb. | 0 | 1 | 3 | to | 0 | 1 | 4 |
| Para-amidophenol, base | lb. | 0 | 12 | 6 | to | 0 | 13 | 0 |
| Para-amidophenol, hydrochlor | lb | 0 | 13 | 0 | to | 0 | 13 | 6 |

## An Inventor's Financial Trouble

THE first meeting of the creditors of L. Albert Groth, "Jotenham," Foxley Lane, Purley, Surrey, was held on Wednesday, December 22, at the offices of the Official Receiver, 132, York Road, Westminster Bridge, S.E. The chair was occupied by Mr. J. B. Turner, the assistant Official Receiver, who reported that proxies had been lodged for the appointment as trustee of Mr. F. S. Salaman.

According to the statement of affairs lodged by the debtor the gross liabilities amounted to £4,428, of which £2,303 were expected to rank. The assets were estimated at £101,127, a surplus of £98,824. The assets comprised cash at bank £2; claim against promoters of a chemical company, £10,000; salary due by chemical company, £1,000; and interest in patents, £90,000. The debtor attributed his present position to "the failure of the promoters of the Electric Leather Industries, Ltd., to carry out the terms of their agreement with me and my borrowing monies from moneylenders at high rates of interest." The Receiving Order was made on a creditor's petition. About 1890 debtor patented a process for the elcetro tanning of leather, which he subsequently improved, and about April, 1918, he agreed to accept for his interest in it a sum of £90,000, payable by 90,000 fully paid shares of £1 each in a limited company which was about to be formed. The shares were allotted to him, and he transferred about 36,000 of them to the promoters of the company, the Electric Leather Industries, Ltd., in consideration of the services rendered by them in the formation of the company, and of their agreeing to provide a working cash capital of £10,000. The debtor alleges that the whole of that amount was not forthcoming, and he borrowed about £1,300 from moneylenders and others for the purpose of demonstrating that the patents could be worked commercially and to provide samples of the products. Subsequently he commenced an action against the limited company for the recovery of £1,000, but discontinued it, and then commenced a fresh action for the recision of the agreement with the company. That action was still pending. Last February he commenced an action claiming damages for libel, against the manager of a tanning company in respect of statements alleged to have been made that the electro-tanning was a failure. That action was still pending. Early in 1920 he entered into an agreement to give another a six months' option to take over his tanning patents. He alleged that the person to whom he gave the option failed to carry out the terms of an agreement, and cross actions between the two are pending. In July a moneylender obtained judgment against the debtor for about £150, and instituted the present proceedings.

# Company News

BRITISH UNION OIL COMPANY.—For the year ended September 30, the accounts show a surplus of £22,614.

CALIFORNIA PETROLEUM CORPORATION.—A regular quarterly dividend of 1¾ per cent. (actual) on the Preferred stock, becomes payable to-day, January 1.

CALIFORNIA PETROLEUM.—To holders of record December 20 regular quarterly dividend of 1¾ per cent. actual on the preferred stock becomes payable on January 1.

PAN AMERICAN PETROLEUM AND TRANSPORT.—A quarterly dividend on the common "A" and "B" stocks of 3 per cent. (actual), payable January 10, has been declared.

LOBITOS OILFIELDS.—An interim dividend of 5 per cent. (less tax), on account of the current year's profits becomes payable on January 31. The same dividend was paid last year.

MEXICAN PETROLEUM.—A quarterly dividend on the common stock of 3 per cent. (actual) becomes payable on January 10, and on the preferred stock 2 per cent. (actual), payable January 1.

BRITISH BURMAH PETROLEUM.—For the year ended July 31 last a balance dividend of 1s. per share (free of tax) becomes payable on February 28.

NEW TAMARUGAL NITRATE.—The numbers of the six per cent. first mortgage debentures are published for £8,500 of the New Tamarugal Nitrate Company, to be paid off at par at the Anglo-South American Bank, Old Broad Street, E.C., to-day, January 1.

SULPHIDE CORPORATION, LTD.—The Earl of Kintore presided on December 22, at the ordinary general meeting. He said the accounts instead of enabling them to declare a handsome dividend, disclosed a merely nominal profit. The reason was labour trouble chiefly.

OIL TRUST.—The accounts from October 1, 1918, to June 30, 1920, show net earnings, after deducting administration and other expenses, amounting to £23,280, which, with the balance brought in, £6,318, gives a total of £29,598, is available for appropriation. The directors deem it desirable that the major portion should be used entirely for the writing off of the balance of the preliminary expenses of the formation of the trust, the discount on loans obtained for business purposes during the war, and the expenses incidental to the increase of the trust capital and issue of new shares.

CASTNER-KELLNER ALKALI.—Mr. G. W. Bafour presided on December 21 at the ordinary general meeting of the Castner-Kellner Alkali Co., Ltd. The Chairman said the results were eminently satisfactory. Last year only £130,000 was available for division, that being due to stagnation of trade following the Armistice. The improvement during the past year was the result of the remarkable increase in their export trade. The tide was now again receding. The Chairman referred to the grant to universities as wise and justifiable. As Chairman of the Cambridge section of the Royal Commission on the Universities he could tell them that those grants were needed, if the trained scientists who could alone keep this country in a position to compete with German industry and keep Great Britain in the front in the chemical industry were to be educated and properly equipped.

SAPON SOAPS, LTD.—At the ordinary general meeting the Earl of Denbigh, presiding, referring to the report, said the company had received 4,750 shares of $50 each from the Cereal Soaps Company, Inc., New York, on the sale to them of their United States patent. They had not taken any credit in their accounts this year for the amount so received, and they have also completed arrangements for the sale of their Canadian patent for which they will receive a sum equivalent to one half the amount received for the United States patent. They had purchased freehold property in Edinburgh from which centre they propose to develop the sale of their soaps in the Scottish area. The company had perfected an entirely new method of making soap, a household and industrial necessity, consumed in immense quantities; they consumed less than half the amount of coal per ton of soap made, and produced the finished article in about one-tenth of the time required for making soap by the ordinary processes.

MEXICAN EAGLE OIL.—Net profit for the year to June 30 amounts to $54,659,217, or $50,501,256 after transferring to legal reserve account $2,657,961, and $1,500,000 to provident fund. $3,543,282 was brought in, making $54,044,538. Profit on trading for the year is $57,272,046 (Mexican gold); less transfer to field redemption account $2,204,868, to depreciation reserve $2,589,489, leaving $52,477,689. The net profit is arrived at after adding interest, &c., $2,181,528. Balance unappropriated, $46,090,061, it is proposed to apply as follows: Final dividend of 49 per cent. on preference shares, making 60 per cent. for the year, $4,165,000; final dividend of 49 per cent. on ordinary, making 60 per cent. for the year $38,110,872; $3,814,189 being carried forward. The Company's crude oil supply is largely in excess of its present pipe-line capacity of 110,000 barrels daily. A third line into Tampico has been agreed to, and when complete will render possible the delivery to Tampico and Tuxpam of 140,000 barrels of crude oil daily.

SOUTH AFRICAN CARBIDE AND BY-PRODUCTS.—This company, says the report for the year to September 30, was formed for the purpose of producing carbide of calcium, of calcium, sulphate of ammonia, tar oils, and motor spirit. For these purposes it was decided to erect at Ballengeich the following four sections of plant: (1) Carbide factory; (2) power station; (3) producer plant; and (4) a low temperature plant. It was also decided to push forward sections 1 and 2 so as to begin producing carbide at the earliest possible moment. It is anticipated that this plant will be in full working order in six or eight months time. Considerable progress has been made with the producer and low temperature sections of the plant, and a portion of this plant will be in operation very shortly after the carbide section. Since the prospectus was issued the market price of carbide in South Africa has risen considerably, and labour and other operating and transport costs have also risen.

## Chemical Trade Inquiries

*The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.*

| LOCALITY OF FIRM OR AGENT. | MATERIALS. | REF. NO. |
|---|---|---|
| Belgium (Vise) ... | Glue; Varnish ... ... ... | 869 |
| Bulgaria ... | Oils; greases; Replies to the Department of Overseas Trade, 35, Old Queen Street, Westminster, London, S.W. 1 | |
| Sydney, Melbourne | Chemicals; oils; greases ... | — |
| Vancouver ... | Soda ash ... ... ... ... | — |
| Kobe, Japan | Heavy chemicals; fertilisers; oils | — |

### Recent Wills

Mr. L. P. Wilson, of Middlesbrough House, Radford Road, Coventry, research chemist ..... £7,390

### Books Received

A TEXT BOOK OF CHEMICAL ENGINEERING. By Edward Hart Easton, Pa. The Chemical Publishing Co., pp. 211.

THE ANALYST'S LABORATORY COMPANION. By A. E. Johnson. London: J. & A. Churchill. Pp. 176. 10s. 6d. net.

The friction of viscous liquids in smooth pipes had been shown to bear a direct relationship to absolute viscosity divided by density, *i.e.*, the commercial viscosity as measured in a Saybolt or other flow-type viscosimeter. Therefore, the friction head could only be determined if the temperature, viscosity and velocity were known, but as the velocity of discharge was dependent upon the pressure obtaining in the elevator body, which pressure was again dependent on the static and frictional head, it was sufficient in practice to assume a mean velocity of, say, 5 ft. per second.

# Commercial Intelligence

*The following are taken from printed reports, but we cannot be responsible for any errors that may occur.*

## London Gazette

### Partnership Dissolved

MOSELEY, J. F., and DREY, N., carrying on business as chemical merchants at 61, Portland Street, Manchester, under the style of Moseley, Drey & Co., by mutual consent as from December 10, 1920. All debts received and paid by N. Drey.

### Companies Winding Up Voluntarily

BRITISH TAR PRODUCTS, LTD. J. Jordan, 11-12, Pall Mall, London, S.W.1, and F. G. Fedden, 108a, Cannon Street, London, E.C.2, Joint Liquidators.

PATENT METALLIC MANUFACTURING CO., LTD. J. R. Dickin and A. J. R. Scott, 37, Moorfields, Liverpool, Joint Liquidators.

### Liquidators' Notices

CARDIFF AND NEWPORT PATENT FUEL CO. (ARROW BRAND), LTD. A general meeting of members will be held at Merthyr House, James Street, Cardiff, on Tuesday, February 1, 1921, at 10.30 a.m. G. D. Tomlinson, Liquidator.

WASHINGTON CHEMICAL CO., LTD. A general meeting of members will be held at the office of Messrs. Cooper & Goodger, 18, Market Street, Newcastle-on-Tyne, on Friday, January 28, 1920, at 3 p.m. F. S. Newall, Liquidator.

## Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

ALLIANCE GLASS WORKS, LTD, London, E.C. Reg. December 16, mort. securing all moneys due or to become due, to National Bank, Ltd.; charged on 2a, Monnow Road, Bermondsey, also a general charge.

DISSOLVED ACETYLENE CO., LTD., London, S.W. Reg. December 13, charge under Land Transfer Acts securing all moneys due or to become due to Barclays Bank, Ltd.; charged on 270, South Lambeth Road, S.W. *Nil. July 30, 1920.

### Satisfaction

SIEMENS BROTHERS DYNAMO WORKS, LTD., London, S.W. Satisfaction reg. December 16, for £490,000, part of £690,000, reg. February 15, 1918.

## Bill of Sale

[*The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.*]

LUNN, H. N., Dalkeith, Wheelsby Road, and 402, Victoria Street, Grimsby, druggist. Filed December 21, £147.

## County Court Judgment

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

DAYKIN, T., Hullstown, near Bolsover, chemist, £15 5s. 5d., November 8.

## New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

LUCRAFT, V. BAYNES (METALS), LTD., 21 Bartletts Buildings, Holborn, E.C. Metal merchants and dealers. Nominal capital, £10,000 in 2,500 preference shares of £1 each, and 7,500 ordinary shares of £1 each. Directors: V. B. Lucraft and E. W. Joy. Qualification of directors, £500.

INDUSTRIAL COAL SUPPLY & TRADING CO., LTD., 25, Mount Stuart Square, Cardiff. Coal, coke, fuel and oil exporters. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, one share.

LOMAS GELATINE WORKS, LTD., Imperial House, Kingsway, W.C. Glue, gelatine and fertiliser manufacturers. Nominal capital, £100 in 100 shares of £1 each. Directors to be appointed by subscribers.

MAYFIELD BROTHERS, LTD., Sculcoates Lane, Hull. Paint, varnish, distemper, colour and enamel manufacturers and merchants. Nominal capital, £45,000 in 15,000 cumulative participating preference shares, and 30,000 ordinary shares of £1 each. Directors: A. S. Mayfield, G. W. Mayfield (permanent directors). Qualification of directors, 100 ordinary shares. Permanent directors, 1,000 ordinary shares.

SERGEANT & PARKS, LTD., 58, Week Street, Maidstone, Kent. Oil, lead and colour merchants, &c. Nominal capital, £12,000 in 11,000 preference shares, and 1,000 ordinary shares of £1 each. Directors: D. G. Park, F. W. Parks, T. R. Foord. Qualification of directors, £1,000.